

## A Support Member System

The invention relates to a support member system, and especially for at least partially supporting a wall.

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Walls constructed from bricks and other building or construction blocks, such as concrete blocks, have a maximum length and height to which they can be constructed without requiring additional support to prevent collapsing of the wall. Conventionally, brick walls have been supported by erecting concrete supports at intervals along the brick wall, both horizontally and vertically, to support the wall. As the brick wall requires to be mechanically tied to the concrete supports, it is conventional practice to use metal rods, which are fixed to the cement work of the brick wall and to the concrete supports to tie the brick wall to the concrete supports.

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However, one of the disadvantages of this conventional approach is that the construction and use of the concrete supports is both time consuming and labour intensive. In order to form the concrete support it is necessary to construct shuttering to enclose the volume into which the concrete is to be poured. The shuttering is normally constructed from wooden boards and the services of a carpenter are required to construct the shuttering. In addition, during construction of the shuttering, it is necessary to insert the metal rods, which will be used to tie the brick wall to the concrete support, through the side walls of the shuttering so that the metal rods extend outside the shuttering and into the internal volume of the shuttering where the concrete is to be poured.

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This requires the services of a steel bender to bend and install the metal rods as required.

After the shuttering is complete and the metal rods have been inserted,  
5 concrete is then poured into the shuttering and permitted to harden before the shuttering is removed. When the shuttering is removed, the metal rods are bonded to the concrete and the brick wall is tied to the concrete supports by the metal rods.

10 Hence, the conventional method of supporting brick walls using concrete supports is time consuming, labour intensive and requires the services of three different tradesman (carpenter, steel bender and concrete pourer) in addition to a brick layer to construct the wall itself.

15 In accordance with the present invention, there is provided a support member system comprising a set of elongate members, each elongate member having a first end and a second end and a predetermined length, the predetermined length of each elongate member being different from the predetermined length of each of the other elongate members, and an end member comprising an  
20 elongate member engagement portion adapted to engage with the first end of an elongate member, and a supporting structure engagement portion, the support structure engagement portion being adapted to engage with a supporting structure, and the elongate member engagement portion permitting the distance from the supporting structure engagement portion to the second

end of the elongate member to be adjustable at least up to the length of the next longer elongate member in the set.

The invention has the advantage that by making the combined length of the elongate member and the end member adjustable, it is not necessary for the elongate member to be custom-made to suit the particular wall to be supported.

Preferably, the elongate member engagement portion slidably engages with the first end of the elongate member. Typically, the elongate member engagement portion slidably engages within the end of the elongate member.

Preferably, the distance between the second end of the elongate member and the supporting structure engagement portion is continuously adjustable.

Preferably, difference in length between any elongate member and the next longest or shortest elongate member is a predetermined increment. Typically, the predetermined increment is substantially the same for all elongate members in the sets.

Preferably, the adjustability of the end member is provided by the length of the elongate member engagement portion, which may be slidably engaged with the elongate member.

Preferably, the system may further comprise a set of end members, each end member in the set having an elongate member engagement portion with a

different length to the length of the engagement portion on each of the other end members.

Typically, the difference in length between the elongate member engagement portions is uniform. However, it is possible that incremental length between elongate member engagement portions of any members in the set could be non-uniform.

Preferably, an end member is engageable with both ends of each elongate member.

Preferably, each elongate member has a side wall adapted to be located adjacent an end of a wall to be supported, in use, the side wall including a number of engagement means which permit a tie member to be mounted on the side wall, the tie member having a portion projecting from the side wall to engage with the wall to be supported.

Preferably, a number of engagement means are provided at discrete locations along the side wall of the elongate member such that the position of the tie members are adjustable.

Typically, the engagement means comprise slots which are preferably substantially parallel to the central longitudinal axis of the elongate member.

Preferably, the engagement means are provided on opposite sides of the elongate member and preferably, on all four sides of the elongate member.

This has the advantage of permitting the elongate member to be used to support two different pieces of wall of the elongate member as a rectangular cross section.

Preferably, the wall is fabricated from individual construction blocks, such as bricks or concrete blocks.

Typically, the tie members are L-shaped with one portion of the L engaging with the engaging means of the side wall of the elongate member and the other portion of the L engaging with the wall to be supported.

Preferably, the elongate member is hollow, and typically, has a substantially rectangular cross section.

Typically, the elongate members are formed from a metal, such as steel.

In one example of the invention, the supporting structure engagement portion may be adapted to engage with another elongate member. Preferably, if the supporting structure engagement portion is adapted to engage with another elongate member, the elongate member engagement portion is mounted non-symmetrically on the supporting structure engagement portion.

An example of a support member system in accordance with the invention will now be described with reference to the accompanying drawings, in which:

- Figure 1 is a perspective view of a brick wall having vertical and  
5 horizontal stiffeners to support the wall;
- Figure 2 is an enlarged and exploded view of region A of Figure 1  
showing the upper end of the vertical stiffener;
- Figure 3 is an enlarged and exploded view of the region B of Figure 2  
showing attachment of a tie to the vertical stiffener;
- 10 Figure 4 is an enlarged and exploded view of region C of Figure 1  
showing a connector for coupling the horizontal stiffener to the vertical  
stiffener;
- Figure 5 is an enlarged and exploded view of region D of Figure 1  
showing the lower end of the vertical stiffener;
- 15 Figure 6 is a perspective view of the tie shown in Figure 3;
- Figure 7 is a perspective view of an alternative form of the connector  
shown in Figure 4; and
- Figure 8 is a side view of a stiffener extended to a longer effective length.
- 20 Figure 1 shows a section of a wall 1 which is supported by a number of vertical  
stiffeners 2 (only one shown) which are interconnected by a number of  
horizontal stiffeners 3 (only two shown). As shown in Figure 1, the vertical  
stiffener 2 supports three portions 4, 5, 6 of the wall 1 and the vertical edges of  
the portions 4, 5, 6 adjacent to the vertical stiffener 2 are mechanically  
25 connected to the stiffener 2 by means of a number of ties 7.

The vertical stiffener 2 is connected at each of its upper and lower ends to an upper support 8 and to a lower support 9, respectively by a connector 10. In addition, each end of the horizontal stiffeners 3 are connected to the side of the vertical stiffener 2 by a connector 11.

Each of the vertical and horizontal stiffeners 2, 3 comprise two generally "C" shaped extrusions 30, 31 attached to each other, for example by welding, to form a hollow box section, as shown in Figure 2. The central side walls of each "C" shaped extrusion 30, 31 has a number of slots 22, 24 which extend in a direction substantially parallel to the longitudinal axes of the stiffeners 2, 3. Each slot 22, 24 also has a respective opening 45, 46.

An exploded and enlarged view of the connectors 10 at the upper and lower ends of the vertical stiffener 2 are shown in more detail in Figure 2 and 5. Connectors 10 include two "U" shaped sections 12, 13 mounted, typically by welding, on a plate 15 such that ends of the U-shaped sections 12, 13 face each other. A gap 14 between the U-shaped sections 12, 13 permits ends 16 of the C-shaped extrusions 30, 31 forming the stiffener 2 to be inserted into the gap 14. The widths of the central section of the U-shaped members 12, 13 and the side section of the U-shaped members and the gap 14 are less than the internal dimensions of the vertical stiffener 2 such that U-shaped sections 12, 13 may be inserted into the upper and lower ends of the vertical stiffener 2.

Mechanical fasteners may be inserted through the plate 15 to attach the plate 15 to the underside of the upper support surface 8 and the upper side of the lower support surface 9. The mechanical fasteners are preferably powder actuated fasteners but may, alternatively, be any type of suitable fastener, such as nails, masonry nails or anchor bolts. If the fasteners are not powder actuated preferably, holes for the fasteners are pre-drilled in the plate 15.

An enlarged and exploded view of region B in Figure 1 is shown in Figure 3 where it can be seen that the ties 7 include a planar section 20 which has two lugs 21 formed thereon. The lugs can be inserted through openings 45, 46 to engage with slots 22, 24 in the side wall of the stiffener 2 to attach the tie 7 to the C-shaped extrusion 30. The length of the slots 22, 24 is greater than the length of the lugs 21 to permit movement of the tie 7, and, therefore, adjustment of the position of the tie 7 with respect to the extrusion 30. The planar section 20 of the tie 7 is connected to a ribbed section 23. The ribbed section 23 has a rib formation 25. The ribbed section 23 makes an angle of approximately 90° with the planar section 20, such that when the lugs 21 are inserted into the slots 22, 24, the ribbed section 23 of the tie 7 extends substantially perpendicularly to the side wall of the stiffener 2. A rear perspective view of the tie 7 is shown in Figure 6 where it can be seen that the lugs 21 extend both rearwardly and to the side of the planar section 20.

An enlarged and exploded view of region C of Figure 1 is shown in Figure 4 where the connector 11 is shown in more detail. The connector 11 includes the U-shaped sections 12, 13 which are identical to the U-shaped sections 12, 13

used in the connector 10. However, the connector 11 has a plate 26 welded to the U-shaped sections 12, 13. The plate 26 has four lugs 27, 28 which are inserted through the openings 45, 46 to engage with slots 22, 24 respectively in the extrusion 30. The U-shaped sections 12, 13 fit into the end of the horizontal stiffener 3 with the ends 16 of the sections 30, 31 of the stiffener 3 locating in the gap 14 of the connector 11.

The connector 11 is shown in more detail in Figure 7. It can be seen that the sections 12, 13 are welded to the plate 26 so that the sections 12, 13 are closer to edge 35 of the plate 26 than to edge 36. This enables the connector 11 to be rotated through 180° to permit a person attaching the connector 11 to the vertical stiffener 2 to select the orientation of the connector 11 that enables it best fit onto the stiffener 2. The lugs 27, 28 are formed by punching out sections of the plate 26 to form the lugs 27, 28, which extend rearwardly behind the plate 26. This permits the rear surface of the plate 26 to be placed against the external surface of the extrusion 30 of the stiffener 2 and the lugs 27, 28 inserted through the openings 45, 46, respectively to engage in respective slots 22, 24 in the extrusion 30 of the stiffener 2 to attach plate 26 (and therefore the connector 11) to the vertical stiffener 2, and so couple the horizontal stiffener 3 to the vertical stiffener 2.

In use, the stiffeners 2, 3 are installed by first installing the vertical stiffener 2. The vertical stiffener 2 is installed by inserting connectors 10 into the upper and lower ends of the stiffener 2 and positioning the stiffener 2 where desired. When the stiffener 2 is in the correct position, fasteners are driven through the

holes 19 in the plate 15 to secure the connectors 10 to the upper and lower support surfaces 8, 9 and thereby retain the vertical stiffener 2 in the correct position.

5 Typically, the length of the vertical stiffener 2 is chosen to be nominally shorter than the height of the vertical gap into which the stiffener has to fit and the depth of the sections 12, 13 facilitate adjustments to ensure that the combination of the connectors 10 and stiffener 2 extend from the lower support surface 9 to the upper support surface 8. It is not essential that the sections 12,  
10 13 on the upper connector 10 are fully inserted into the upper end of the stiffener 2, it is sufficient that only a portion of the sections 12, 13 are inserted into the upper end of the stiffener 2. Hence, this facilitates adjustment of the height of the stiffener 2 to take account of differences and tolerances between the designed height of the wall 1 and the actual height of the wall 1.

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After the vertical stiffener 2 has been installed, the wall 1 is constructed and ties 7 are mounted at appropriate intervals (typically every 300 to 400mm vertically) on the extrusions 30, 31 of the vertical stiffener 2 such that the ribbed section 23 is mechanically locked to the wall 1 by the ribbed portion 23 being located  
20 between layers of bricks and held by the cement mortar between the layers. When the lower portions 4, 5 are constructed to a level where the horizontal stiffener 3 is required, the last layer of bricks is completed except for the two end bricks adjacent the vertical stiffener. The connectors 11 are inserted into each end of a horizontal stiffener 3 and the lugs in the plate 26 of the  
25 connectors 11 are inserted into the slots 22, 24 in the extrusions 30, 31 of

adjacent vertical stiffeners 2 to mount the horizontal stiffener onto the last layer of bricks. Each end brick is then laid. Continuation of construction of the wall 1 above the horizontal stiffener 3 then continues by construction of the wall portion 6 above the stiffeners 3, with ties 7 inserted along the side 30, 31 of the stiffener 2 at appropriate intervals to engage between the adjacent layers of bricks to tie the wall portion 6 to the vertical stiffener 2.

In order that the stiffeners 2, 3 can be prefabricated to suit most applications, the stiffeners are manufactured in 250mm incremental lengths from typically, 3m up to 7.5m. A number of end connectors 10, 11 are also provided with the sections 12, 13 manufactured in different lengths, such as 200mm, 400mm and 600mm. This enables the length of a particular stiffeners 2, 3 to be extended to have a longer effective length by not inserting the sections 12, 13 of the upper end connector 10 or the connector 11 all the way into the respective stiffeners 2, 3 and enables a certain length of stiffeners 2, 3 to be used in applications where the actual stiffener length required is longer. This permits the stiffeners 2, 3 to be manufactured in predetermined incremental lengths and for the effective length to be adjusted by choosing the end connectors 10, 11 with the most appropriate length of the sections 12, 13.

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An example is shown in Figure 8, where the stiffener 2 is used to support a wall 50. The connector 10, which is fastened to an upper support 8, has been used to extend the effective length of the stiffener 2. It will be noted that the U-shaped sections 12, 13 of the connector 10 are not fully inserted into the stiffener 2 and this enables the stiffener 2 to be used to support the wall 50

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although the wall 50 is higher than the top end 53 of the stiffener 2. The horizontal stiffener 3 can be extended in a similar manner.

For example, the end connector 10 with the longest sections 12, 13, that is  
5 600mm, will enable the effective length of the stiffener 2 to be extended by up to 250mm (the length of the next longest stiffener 2) while still maintaining a 350mm length of the sections 12, 13 engaged inside the stiffener 2. Using two end connectors 11 with a length of 600mm for the sections 12, 13 on the horizontal stiffener 3 will enable the horizontal stiffener 3 to be extended by up  
10 to 500mm while still maintaining a 350mm length of the sections 12, 13 engaged with the stiffener 3. The minimum engagement portion required for each stiffener assembly is calculated based on geometry and loading considerations.

15 End connectors 10, 11 with shorter sections 12, 13 can be used where the effective length of a stiffener 2, 3 required to be extended is shorter. For example, the connector 10 with the 200mm sections 12, 13 may be used where the extension required is less than 75mm, and the connector 10 with the 400mm sections 12, 13 may be used where the extension required is less than  
20 150mm. However, the length of the sections 12, 13 used for a particular extension length may depend on the particular application.

Therefore, the invention has the advantage of providing a support member system in which the length of the stiffeners 2, 3 do not have to be specially  
25 manufactured for each application.

**CLAIMS**

1. A support member system comprising a set of elongate members, each elongate member having a first end and a second end and a predetermined  
5 length, the predetermined length of each elongate member being different from the predetermined length of each of the other elongate members, and an end member comprising an elongate member engagement portion adapted to engage with the first end of an elongate member, and a support structure engagement portion, the support structure engagement portion being adapted  
10 to engage with a support structure, and the elongate member engagement portion permitting the distance from the support structure engagement portion to the second end of the elongate member to be adjustable at least up to the length of the next longer elongate member in the set.
- 15 2. A system according to claim 1, wherein the elongate member engagement portion slidably engages with the first end of the elongate member.
3. A system according to claim 2, wherein the elongate member engagement portion slidably engages within the first end of the elongate  
20 member.
4. A system according to claim 2 or claim 3, wherein the adjustability of the end member is provided by the length of the elongate member engagement portion.

5. A system according to any of the preceding claims, wherein the distance between the second end of the elongate member and the support structure engagement portion is continuously adjustable.
- 5 6. A system according to any of the preceding claims, wherein the difference in length between any elongate member and the next longest or shortest elongate member is a predetermined increment.
7. A system according to claim 6, wherein the predetermined increment is  
10 substantially the same for all elongate members in the set.
8. A system according to any of the preceding claims, wherein the end member is engageable with both ends of each elongate member.
- 15 9. A system according to any of the preceding claims, further comprising a set of end members, each end member in the set having an elongate member engagement portion with a different length to the length of the engagement portion on each of the other end members.
- 20 10. A system according to claim 9, wherein the difference in length between the elongate member engagement portions is uniform.
11. A system according to any of the preceding claims, wherein each elongate member has a side wall adapted to be located adjacent an end of a  
25 wall to be supported, in use.

12. A system according to claim 11, the side wall including a number of engagement means which permit a tie member to be mounted on the side wall, the tie member having a portion projecting from the side wall to engage with the wall to be supported.

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13. A system according to claim 12, wherein a number of engagement means are provided at discrete locations along the side wall of the elongate member such that the position of the tie members are adjustable.

10 14. A system according to claim 12 or claim 13, wherein the engagement means comprise slots.

15 15. A system according to any of claims 12 to 14, wherein the engagement means are provided on opposite sides of the elongate member and preferably, on all four sides of the elongate member.

16. A system according to any of claims 11 to 14 further comprising one or more side wall connectors, each side wall connector having an attachment section for attachment to a side wall of one of the elongate members, and a connection section for connection to an additional elongate member, wherein when the attachment section is connected to a first elongate member and the connection section is connected to an additional elongate member the first elongate member is transverse to the additional elongate member.

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17. A system according to claim 16 in which the connection section of each of the side wall connectors is mounted asymmetrically on the attachment section of the side wall connector.
- 5 18. A system according to any of the preceding claims, wherein the elongate members are for supporting a wall constructed from construction blocks.