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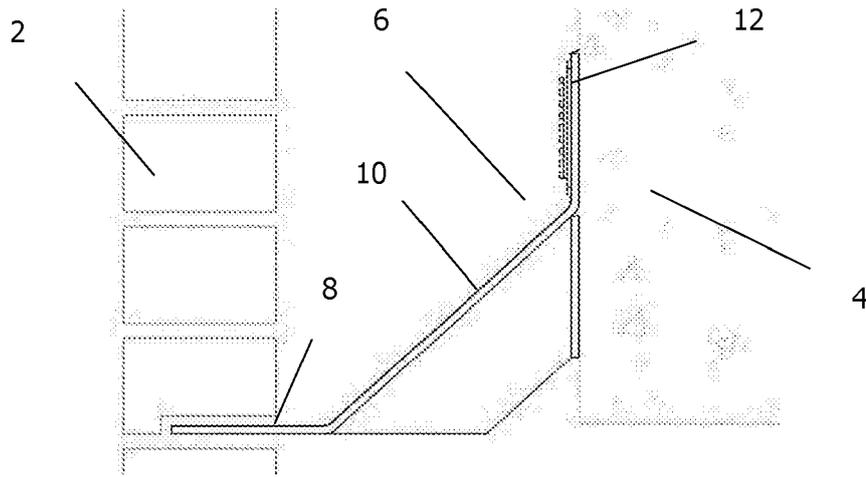


Figure 1a

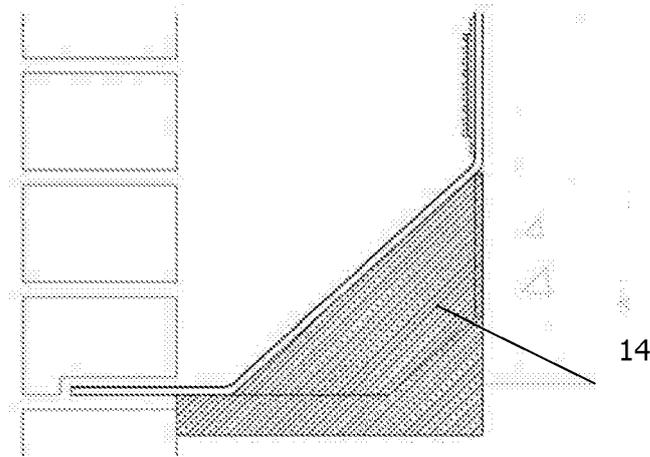


Figure 1b

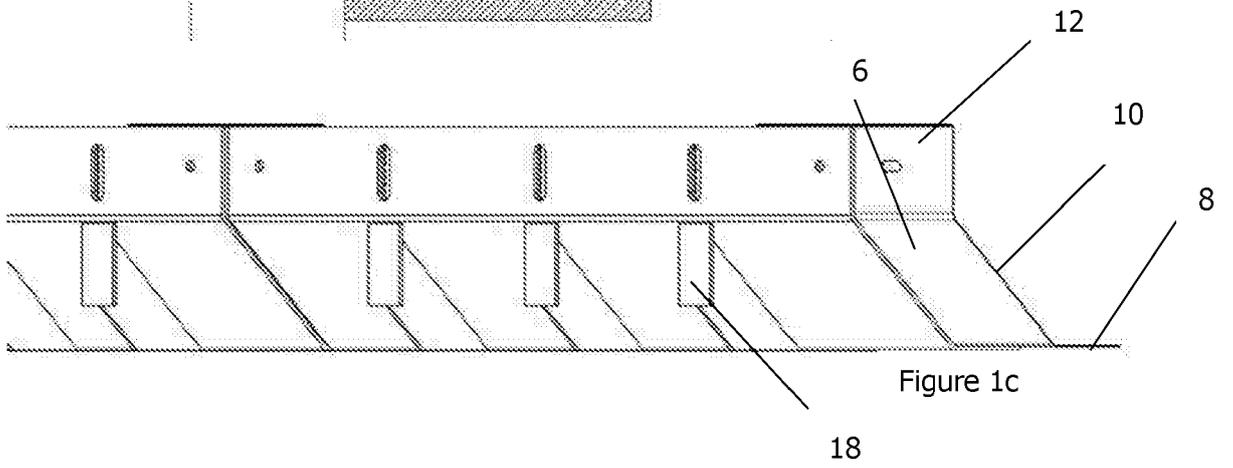


Figure 1c

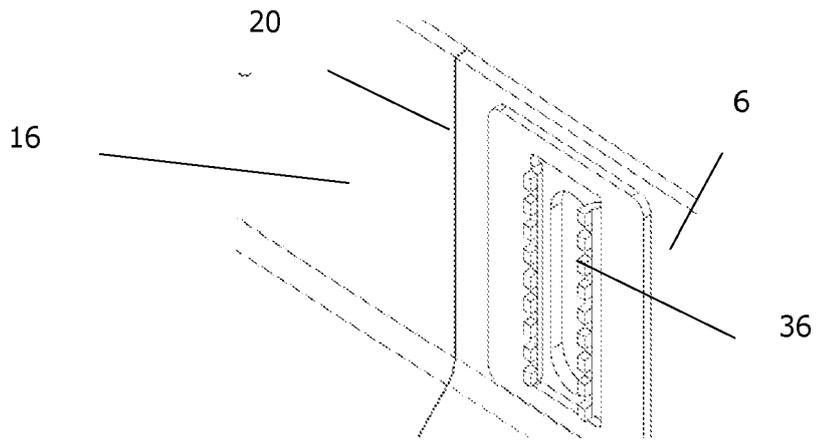


Figure 2a

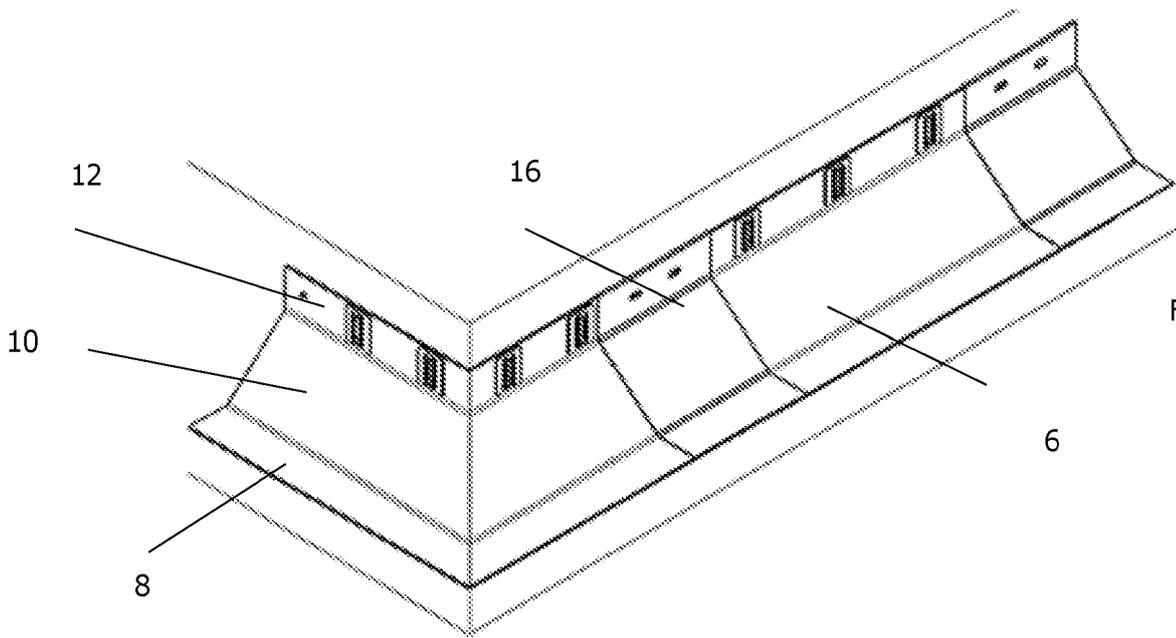


Figure 2b

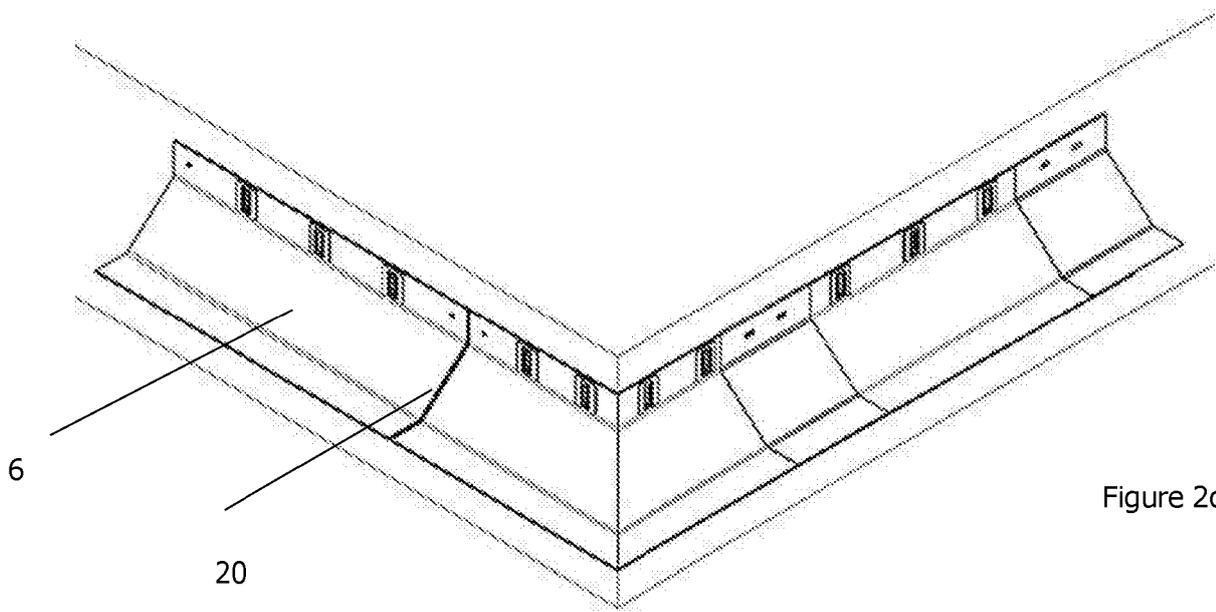


Figure 2c

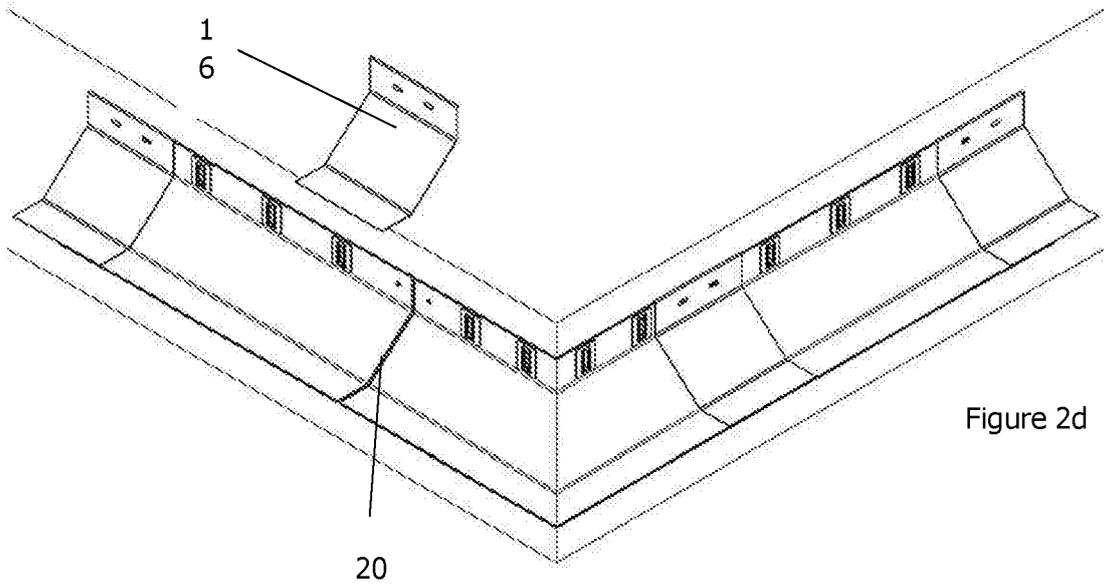


Figure 2d

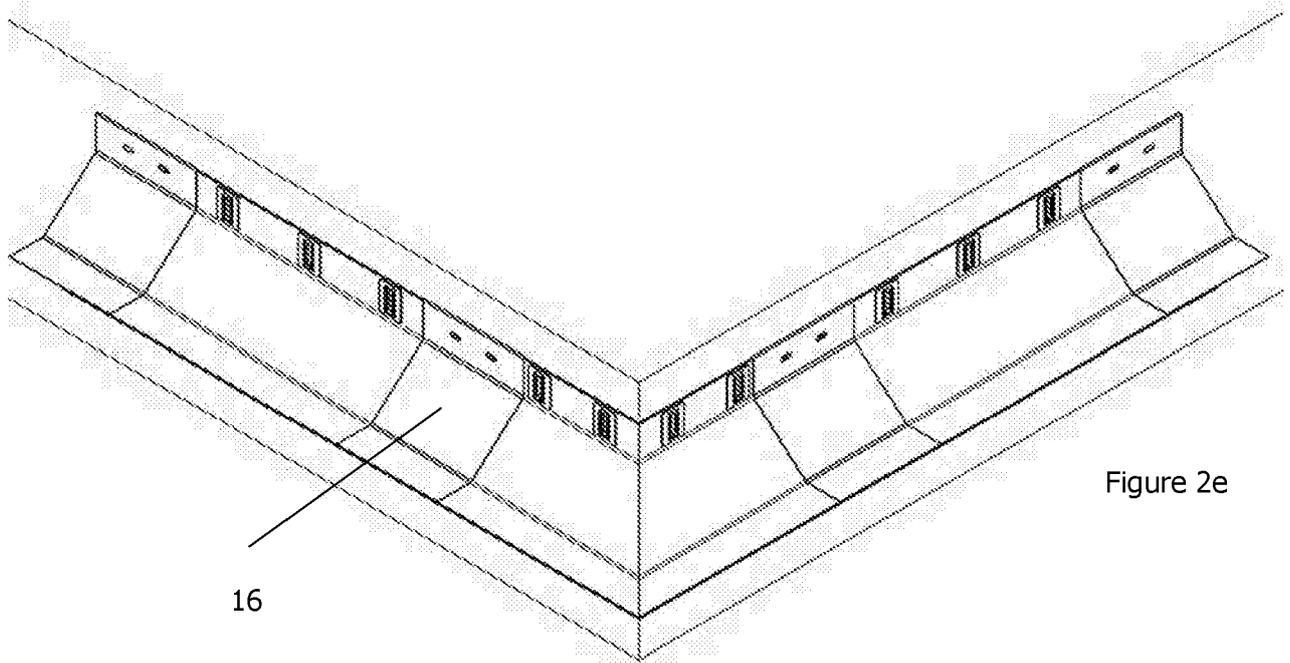


Figure 2e

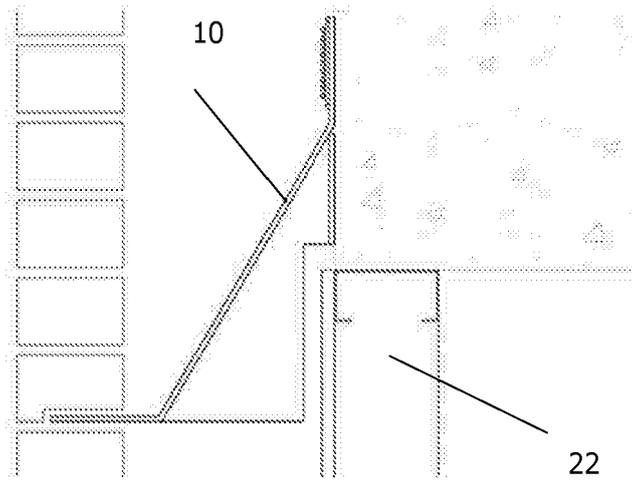


Figure 3a

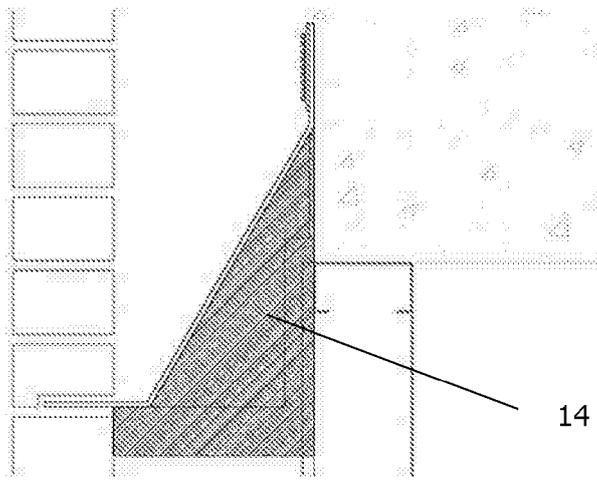


Figure 3b

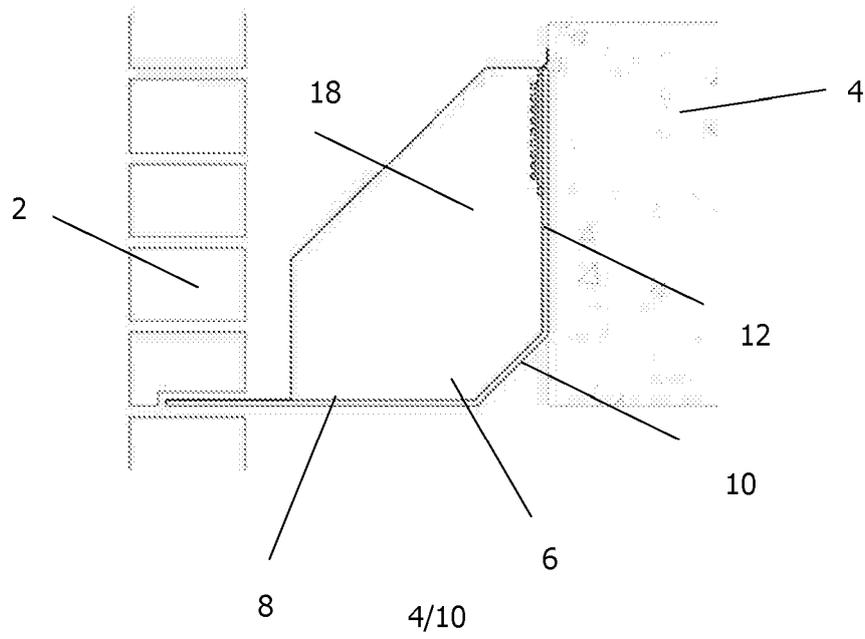


Figure 4a

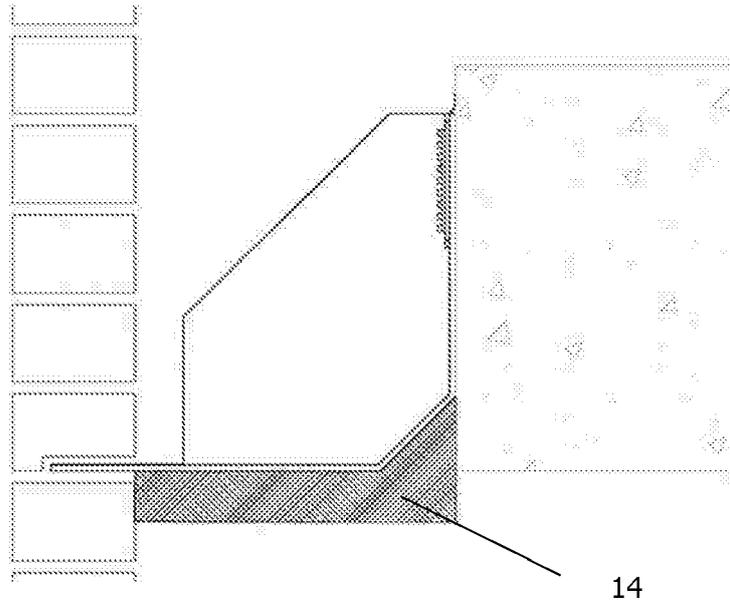


Figure 4b

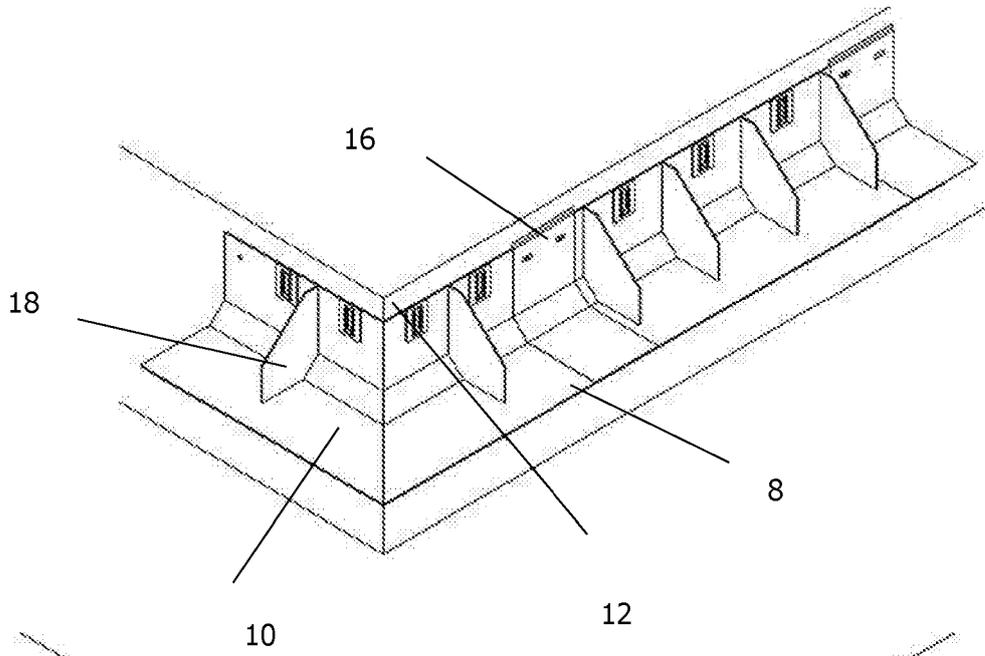


Figure 5a

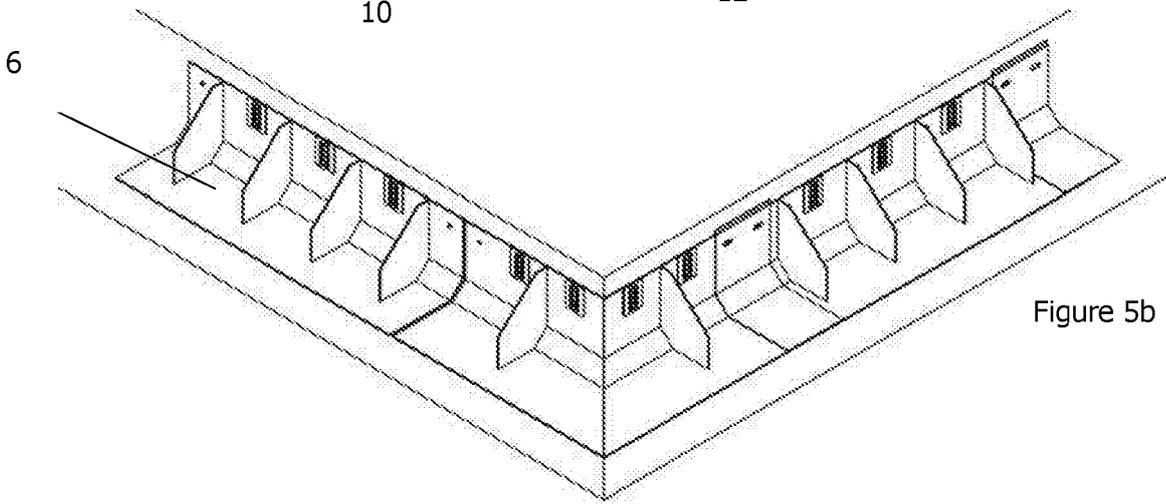


Figure 5b

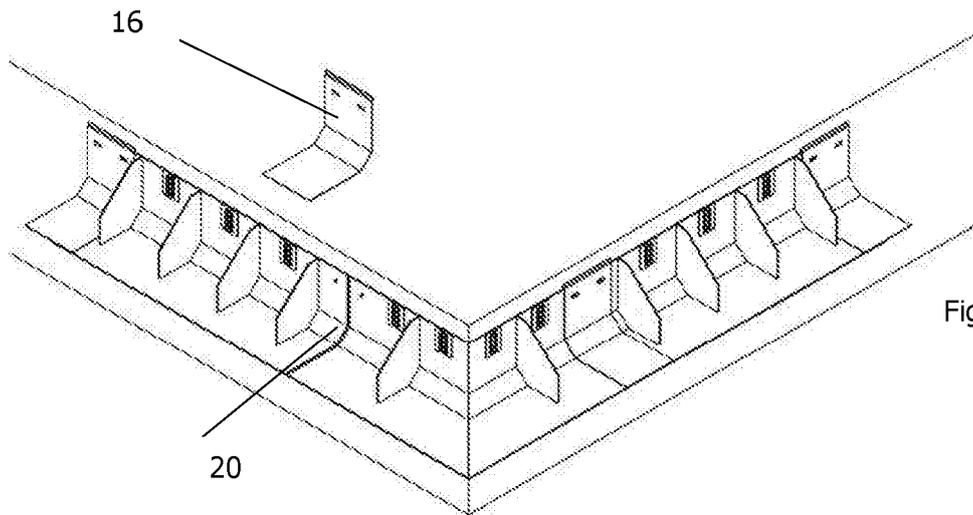


Figure 5c

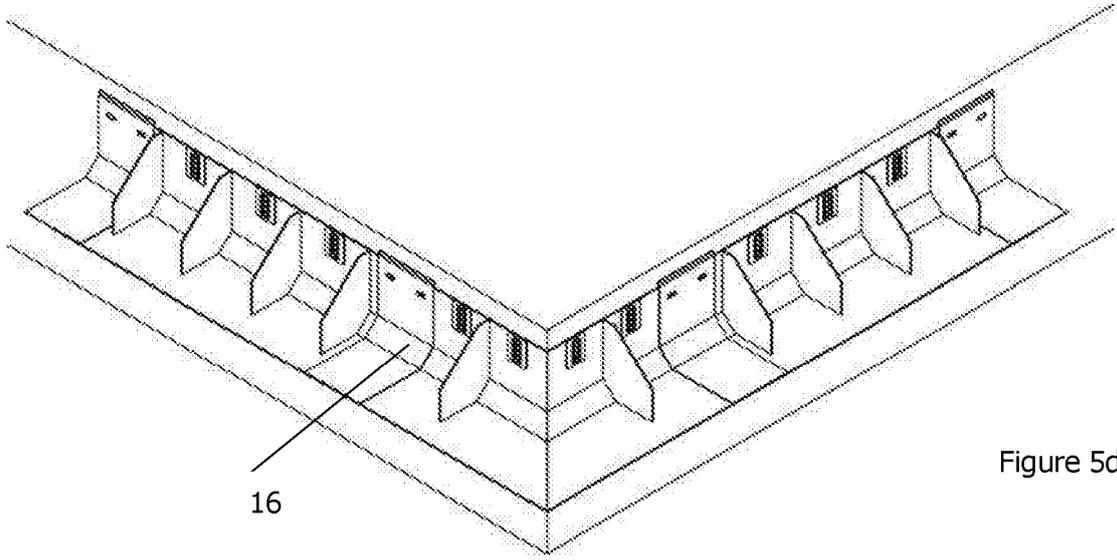


Figure 5d

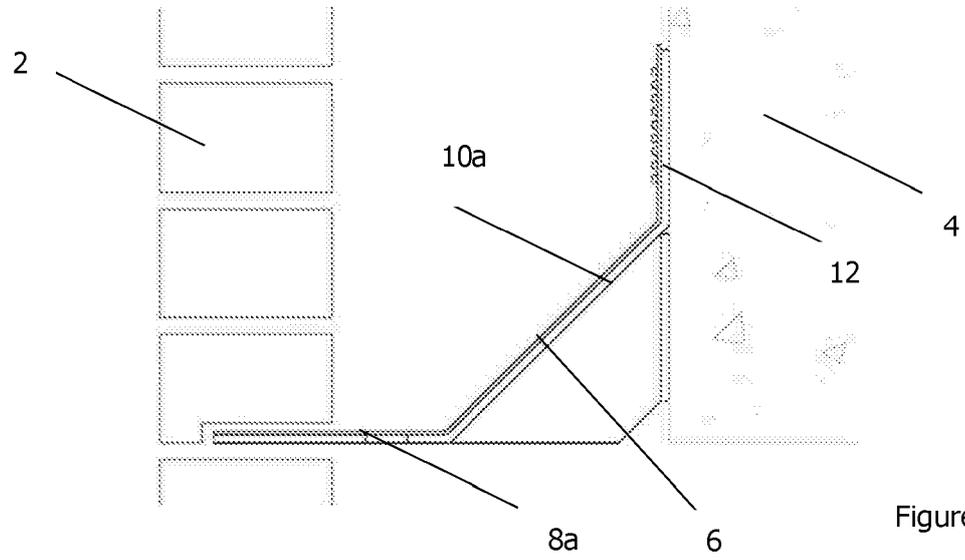


Figure 6a

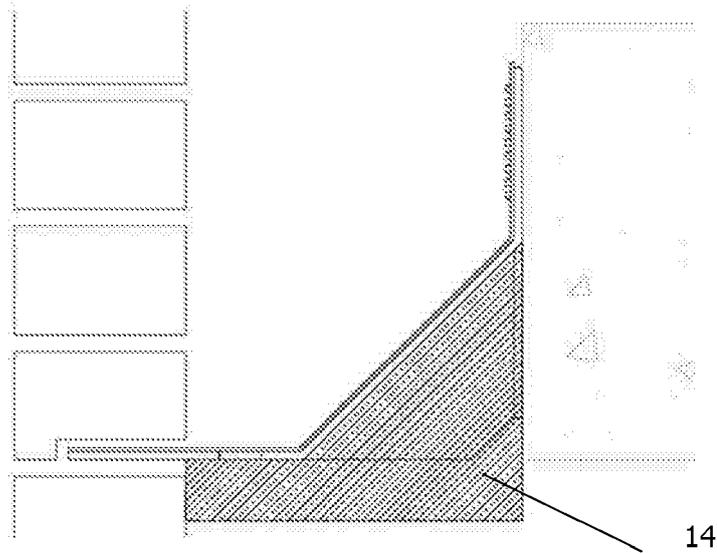


Figure 6b

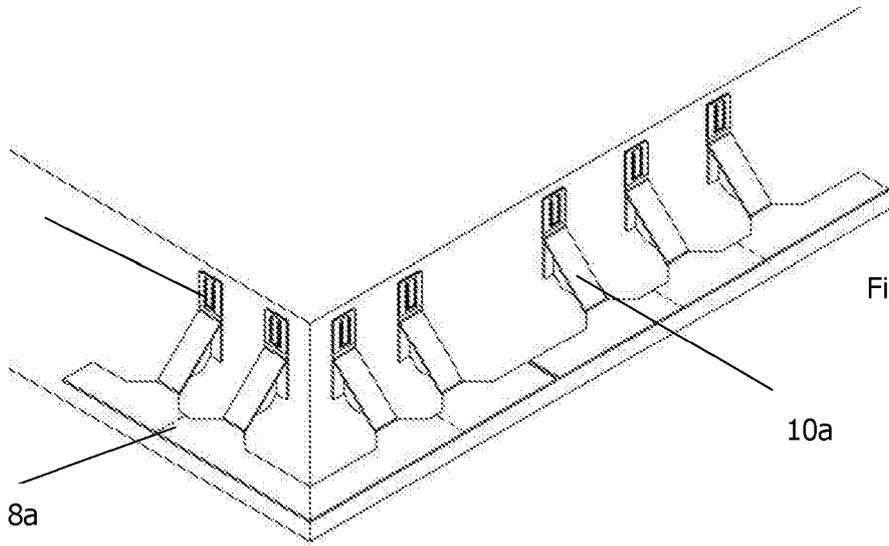


Figure 7a

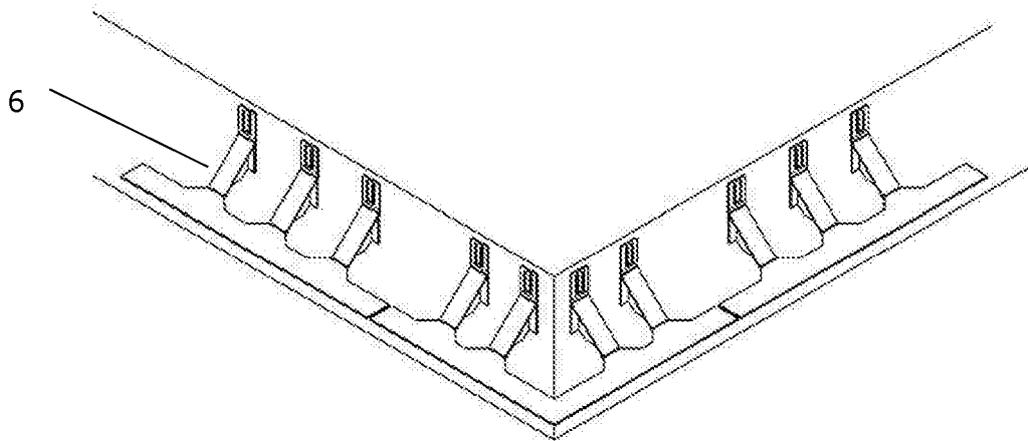


Figure 7b

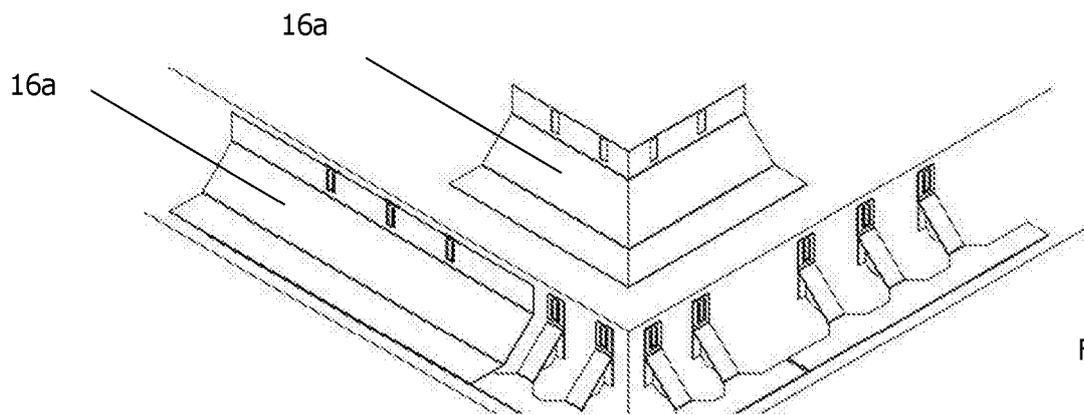


Figure 7c

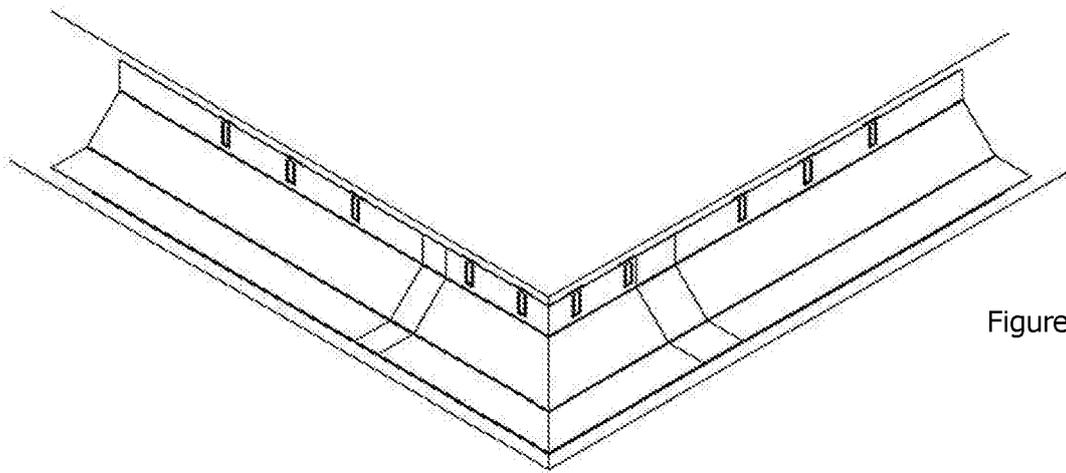


Figure 7d

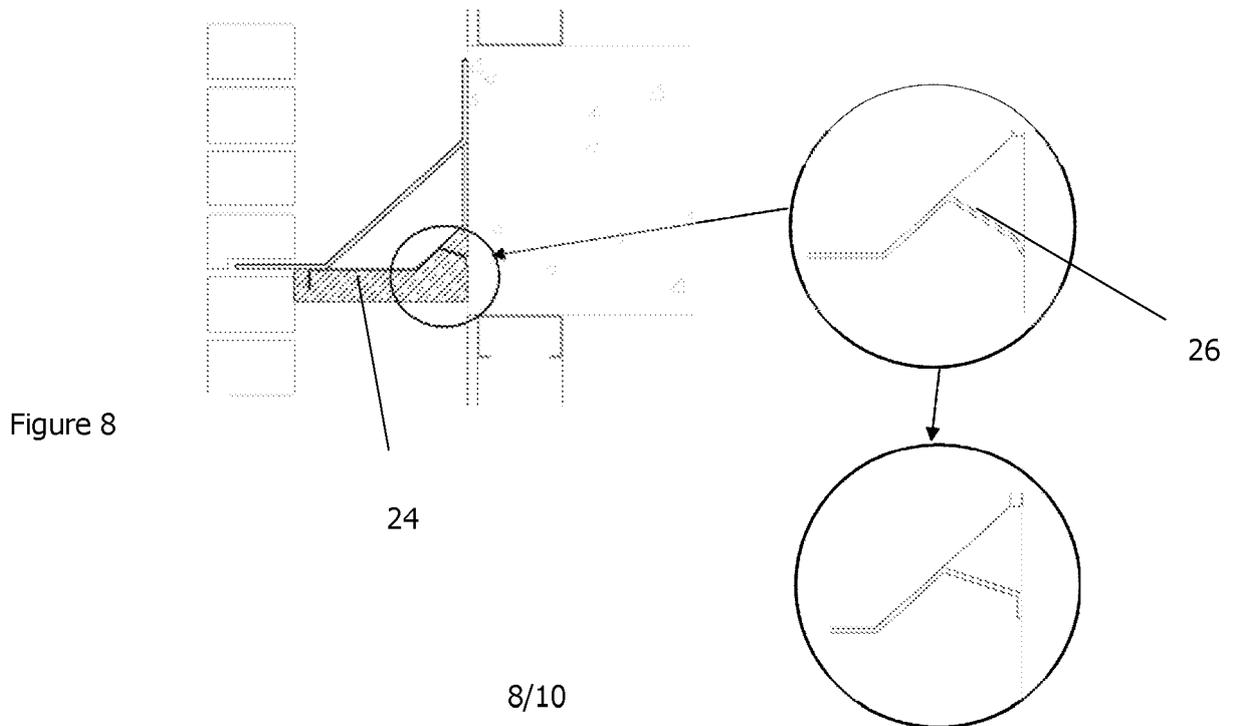


Figure 8

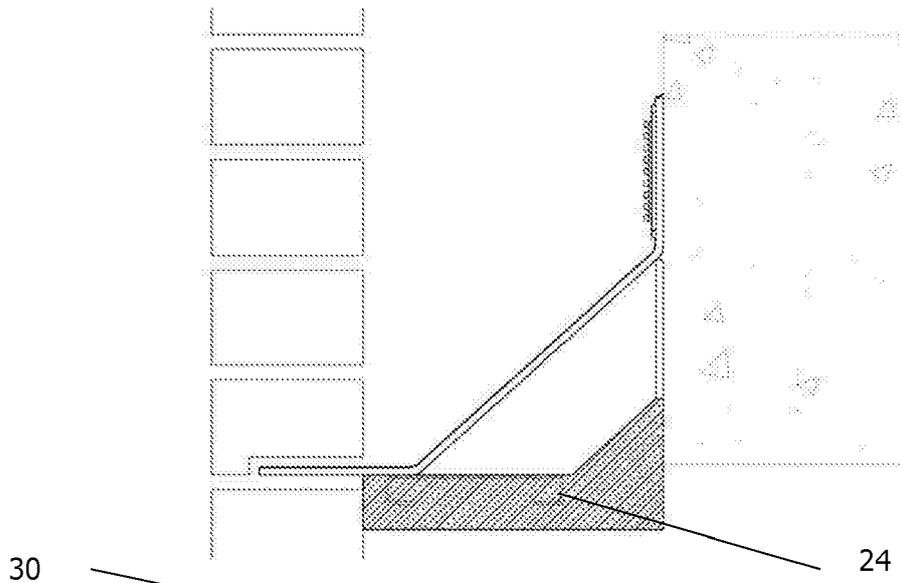


Figure 9

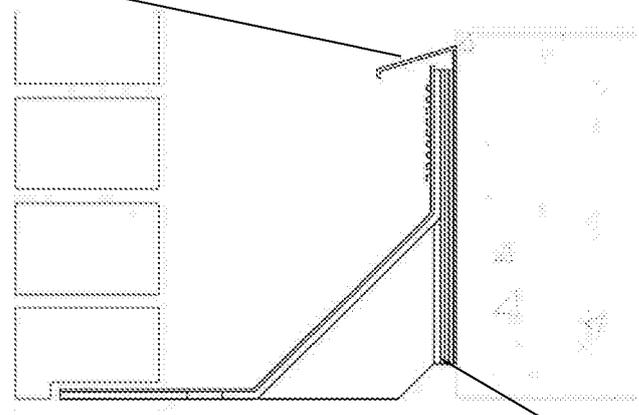


Figure 10a

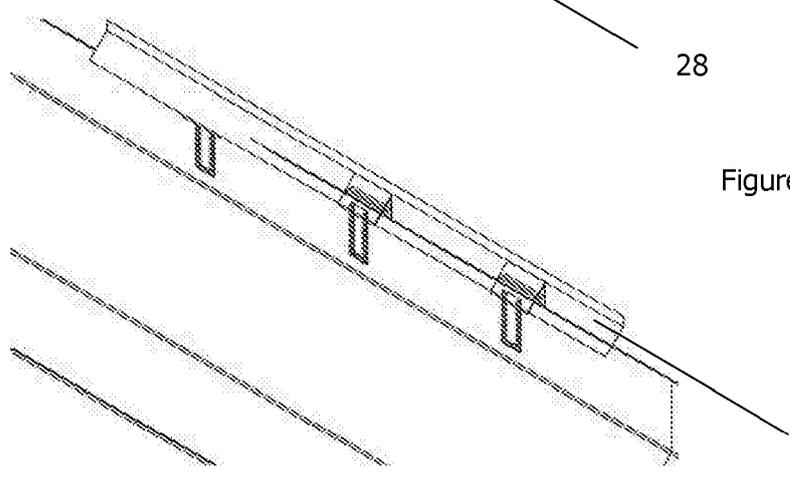


Figure 10b

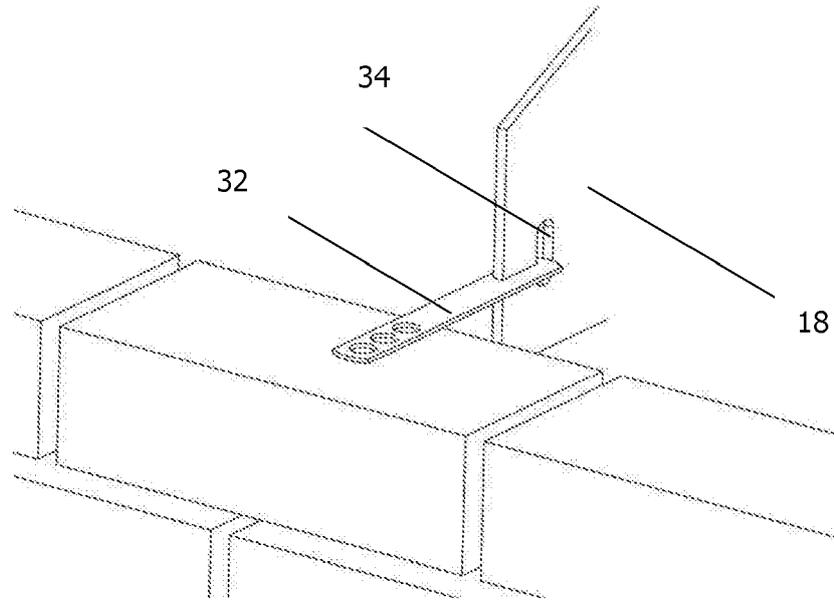


Figure 11

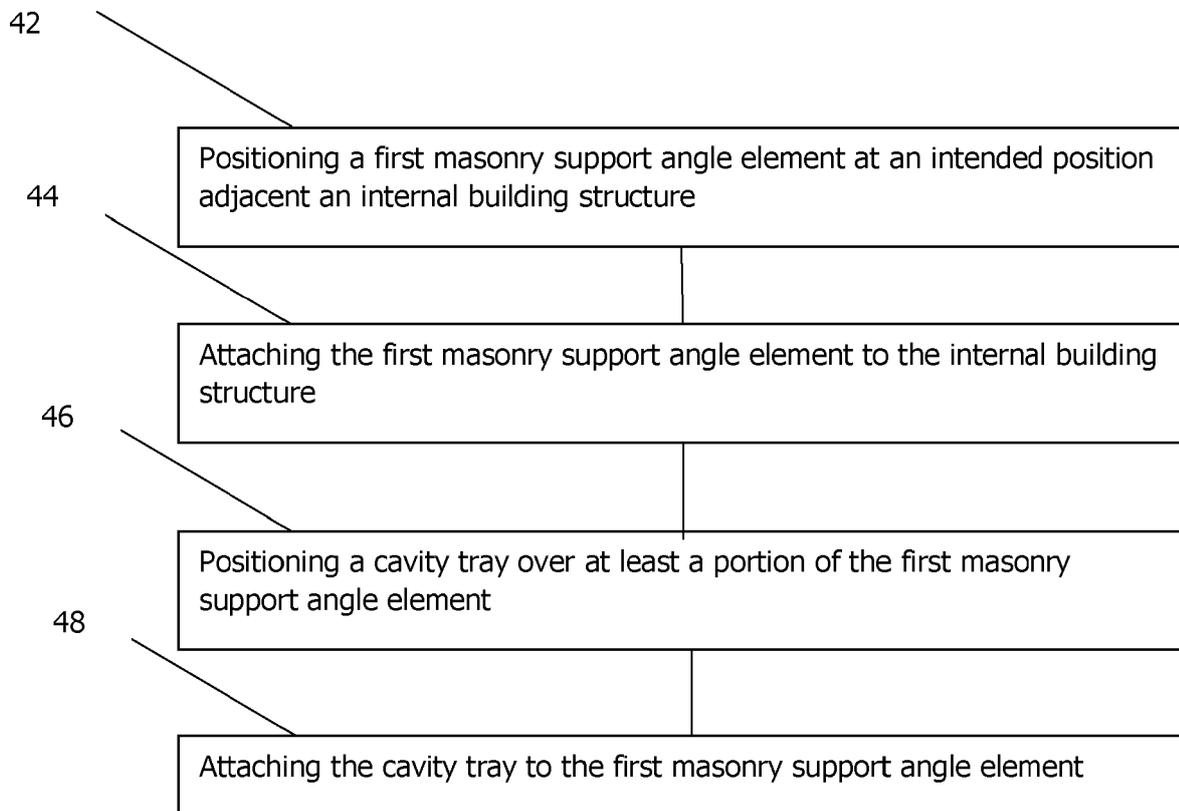


Figure 12

Combined Support Unit for the Support of Masonry

Field of Invention

The present invention relates to a combined support unit to support masonry elements (often forming a masonry façade). The combined support unit fixes to the internal building structure
5 such that the load of the masonry is supported by the internal building structure.

Background of Invention

Modern building techniques make use of prefabricated components that are used to speed up and simplify the erection of building structures. Many buildings are constructed with an inner building structure that is provided with a decorative masonry façade that is secured to the
10 internal building structure by various means. The masonry façade provides an attractive external appearance for the building but does not form part of the load-bearing substructure. As it is not load bearing, complex masonry patterns can be employed in its construction as specified by an architect that would otherwise be difficult to execute directly on site or not be possible if load-bearing considerations needed to be taken into account. The support for the
15 façade then secures the masonry to the internal building structure. Such supports are known but suffer from various problems.

This construction presents many challenges. For example, there is often a cavity, gap or channel situated between the masonry façade and the internal building structure. Within this channel the masonry support is often situated. As will be appreciated, it is possible that water,
20 vapour and any other liquids, may permeate into the cavity structure through the channel, and form droplets which will, under the act of gravity, drop down the channel. Additionally, the interior sides of the masonry and the internal building structure within the cavity also provide a condensation point for water, or other liquids, which will also mean that droplets and moisture will run down the sides of these surfaces. It will be appreciated that water gathering
25 at the bottom of the channel can lead to damage to both the masonry and in particular to the internal building structure. It is further noted that many building materials, especially bricks, are permeable and will soak up and store water if this is not satisfactorily removed. Moreover, if moisture gets into the internal leaf of the internal building structure then this may cause problems with damp in the internal of the building. Such issues are undesirable, as they
30 shorten the lifetime of the structure or lead to undesirable and unwanted repairs falling due.

Systems are known for attracting and guiding the moisture which arises in the cavity wall. However, such systems often take time to erect on site, which increases the cost and

complexity of the build. Moreover, increased safety in building regulations and the like, requires that all building materials conform to high standards in fire prevention and that they minimise the possible spread of any fire. The present disclosure presents a masonry support that is designed for construction off-site to enable quick and simple installation at building sites, whilst also ensuring appropriate conformity with building regulations, in particular the requirement of low flammability to the structure. Whilst some such supports have previously been described they have been manufactured multiple sections. Such sections make the manufacture of the building more complex, and also offer failure points within the structure, and further points in which water ingress can cause damage. The present invention seeks to mitigate at least some of these aforementioned problems.

Moreover, as is known from the Grenfell Tower disaster (14 June 2017, UK) it is imperative that buildings such as high rise buildings, and especially those clad with materials have adequate fire safety. As such fire barriers are required to ensure that the spread of fire is slowed. One form of fire barrier comprises a RockwoolSP120. However, there are in some situations problems associated with fitting this fire barrier whilst also fitting a masonry support and cavity tray system. These issues can leave either problems with water drainage, or even compromised fire safety if these elements cannot be fitted together in a complementary manner. Some embodiments of the present invention improve the fire safety of building structure by providing additional fire breaks and barriers within the masonry support.

It is an object of the present invention to overcome or substantially mitigate the aforementioned disadvantages.

Summary of Invention

Aspects of the invention are set out in the independent claims. Optional features are set out in the dependent claims.

According to a first aspect of the invention there is provided a masonry support system comprising a first masonry support angle element comprising a distal end configured to act as a bracket to take load from masonry, the distal end configured to be in the horizontal position in use, a proximal end configured to be attached to a load bearing element of an internal building structure to transfer the load of the masonry to the load bearing element of the internal building structure, the proximal end being configured to be in the vertical position in use, and a connecting portion angled to connect the proximal and distal ends, and a cavity tray configured to be positioned onto and to be affixed to the first masonry support angle element, the cavity tray comprising a proximal end configured to attach to the proximal end

of the first masonry support angle element and configured to be vertical in use, a distal end configured to lie horizontal during use, and a connecting portion configured to connect the proximal and distal ends, the cavity tray configured to reduce water accumulation between the masonry and the internal building structure. This may allow the masonry to be securely held by the support, whilst the support may be manufactured off-site and installed efficiently.

It is noted that a first masonry support angle element may form an aspect in its own right. The first masonry support angle element comprises a distal end configured to act as a bracket to take load from masonry, the distal end configured to be in the horizontal position in use, a proximal end configured to be attached to a load bearing element of an internal building structure to transfer the load of the masonry to the load bearing element of the internal building structure, the proximal end being configured to be in the vertical position in use, and a connecting portion angled to connect the proximal and distal ends, wherein the connecting portion is configured to divert fluid condensing on the internal building structure and flowing down the internal building structure, so that such fluid may be controlled.

The following optional statements are optional on both the first aspect, and on the masonry support angle element aspect described above.

Optionally, the masonry may further comprise a second masonry support angle element, the second masonry support angle element comprising a distal end configured to act as a bracket to take load from masonry, the distal end configured to be in the horizontal position in use, a proximal end configured to be attached to a load bearing element of an internal building structure to transfer the load of the masonry to the load bearing element of the internal building structure, the proximal end being configured to be in the vertical position in use, and a connecting portion angled to connect the proximal and distal ends. This may allow the masonry support to be manufactured to set dimensions and different sections used together to improve efficiency in construction.

Optionally, wherein the cavity tray is an infill cavity tray. An infill cavity tray is utilised to joint components together while closing the necessary movement and tolerance gap between each structural support. It ensures that no moisture can penetrate between components.

Optionally, wherein the infill cavity tray is situated between the first and second masonry support angle elements. This allows the cavity tray to act as a join between the elements to improve simplicity of construction.

Optionally, wherein the infill cavity tray prohibits water from passing between the first and second masonry support angle elements. This may reduce water ingress between the elements and so increase the lifespan of the components.

5 Optionally, wherein in use the distal portion of the first masonry support angle element is configured to be situated within a recess in the masonry, and wherein the join between the distal end of the first masonry support angle element and the connecting portion of the first masonry support angle element is situated adjacent the masonry during use. This may allow the angled connecting portion to extend the majority of the length between the masonry and the internal building structure, and therefore reduce the area in which water may pool on the support.

10

Optionally, wherein the distal end of the first masonry support angle element extends within a cavity between the masonry and the internal building structure during use, and wherein the join between the distal end of the first masonry support angle element and the connecting portion of the first masonry support angle element is positioned adjacent the internal building structure during use.

15

Optionally, wherein the connecting portion of the first masonry support angle element is the same width as the proximal and distal ends of the first masonry support angle element. This means that the width of the support angle element is constant, and therefore water may be efficiently channelled by the support angle element.

20 Optionally, wherein the connecting portion of the masonry support angle element is narrower than distal end of the masonry support angle element, and optionally wherein the connecting portion of the masonry support angle element is narrower than the proximal end of the masonry support angle element. The narrower connecting portion may enable weight and material to be saved in the construction of the masonry support angle element. This lower weight lowers load on the internal building structure which may improve life span, or reduce costs associated with increasing the strength of the internal structure.

25

Optionally, wherein the distal portion of the first masonry support angle element is conjoined with the distal portion of a neighbouring masonry support angle element, optionally wherein the distal portion is fused with a third further neighbouring masonry support angle element.

30 This may increase the strength of the masonry support angle element. This may be particularly advantageous if the connection portion is narrower to ensure strength of the structure.

Optionally, wherein a single cavity tray affixes onto the top of the first masonry support angle element and the neighbouring masonry support angle element, optionally wherein the cavity tray affixes onto the top of a third further neighbouring masonry support angle element. This may make the construction of the building even simpler as fewer cavity trays are needed, simplifying the installation process.

Optionally, wherein the masonry support angle element comprises a support stiffener positioned to be perpendicular to each of the proximal, distal and connecting portions. The support stiffener may advantageously increase the strength of the masonry support angle element.

10 Optionally, wherein the support stiffener provides strength to the masonry support system.

Optionally, wherein at least a portion of said system is covered by intumescent paint. This is advantageous in the case of fire as the paint reduces the probability of the fire spreading.

Optionally, the masonry support system further comprising caps over any indents, or holes to prevent water ingress.

15 Optionally, wherein the cavity tray is configured to be attached to the internal building structure. A direct attachment may ensure that the cavity tray remains in a fixed place and there is less movement of elements of the structure after completion.

Optionally, the masonry support system further comprising a barrier tray attached under the masonry support angle such that in the event of fire the barrier tray seals one floor from another to prevent spread. This is advantageous in the event of fire to prevent spread.

20 Optionally, wherein the barrier tray is configured to abut the internal building structure. This may provide less space for fire to spread.

Optionally, wherein a proximal end of the barrier tray adjacent the internal building structure forms a chevron. This advantageous as the chevron may provide a point of attachment, or simply friction, to the internal building structure such that the barrier tray remains in a fixed position relative to the internal building structure.

25 Optionally, wherein the chevron of the proximal end of the barrier tray is configured to be adjustable for ease of installation.

Optionally, wherein the barrier tray comprises hooks extending downwards from the tray, preferably wherein said hooks are integrated within the barrier tray. The hooks may be

30

configured to allow for alternative/additional fire resistant components to be attached to the bottom of the barrier tray and/or the masonry support angle element.

Optionally, wherein intumescent paint is applied to the barrier tray. The paint will reduce the spread of fire.

- 5 Optionally, the masonry support system further comprising a thermal shim configured to be positioned at the at the attachment points between the internal building structure and the masonry support angle element to reduce thermal passage between the internal building structure and the masonry support system.

- 10 Optionally, the masonry support system further comprising an additional capping rail between shims to prevent water ingress.

Optionally, the masonry support system further comprising a wall tie coupled to the support stiffener, or to the proximal portion of the first masonry support angle element. The wall tie may add a further point of attachment between the masonry support angle element and the masonry, and so improve the connection.

- 15 Optionally, wherein the wall tie is attached to the support stiffener through a vertical slot on the support stiffener. As the support stiffener is perpendicular to the masonry support angle element this means that water ingress into such a slot is less of a problem and less likely to cause damage to the structure. Therefore, this greatly improves the connection between the masonry and the support element without compromising the flow of fluid within the channel.

- 20 Optionally, wherein the slot enables the height of the wall tie to be adjusted in use to match the intended height of the masonry. This allows the construction to be simplified and allows tolerances to be increased.

- 25 Optionally, the masonry support system further comprising stiffening members attached to the masonry support angle element to increase the load capacity of the masonry support angle element.

According to a second aspect there is provided a method of installing the masonry support system of the first aspect, the method comprising the steps of:

 positioning a first masonry support angle element at an intended position adjacent an internal building structure;

- 30 attaching the first masonry support angle element to the internal building structure;

positioning a cavity tray over at least a portion of the first masonry support angle element;

attaching the cavity tray to the first masonry support angle element. This method provides a simple and efficient method of installation.

5 Optionally, the method further comprising:

positioning a second masonry support angle element at a second intended position adjacent the internal building structure, and adjacent the first masonry support angle element;

attaching the second masonry support angle element to the internal building structure;

10 attaching the cavity tray to the second masonry support angle element, such that the cavity tray overlies at least part of both the first and second masonry support angle elements and is affixed to both. This may enable set sizes of masonry support angle to be used for construction thus reducing costs, as the elements are configured to be joined by the cavity tray at a set position.

15 Optionally, the method further comprising attaching the cavity tray to the internal building structure.

Optionally, the method further comprising positioning caps over any attachment points or unused holes or indents to prevent water ingress.

20 Optionally, the method further comprising attaching a barrier tray beneath the first masonry support angle element such that it abuts the internal building structure, preferably wherein the attaching comprises welding. This may reduce the spread of fire.

Optionally, the method further comprising adjusting the chevron of the proximal end of the barrier tray to conform with the internal building structure. This may reduce the spread of fire further by reducing positions through which the fire may spread.

25 Optionally, the method further comprising attaching a wall tie to the support stiffener. This may increase the strength of the connection between the masonry support angle element and the masonry. This may also act to transfer loads that are placed on the structure during periods of high wind back to the internal building structure.

30 Optionally, the method further comprising attaching a shim to the attachment point between the masonry support angle and the internal building structure. The shim may ensure that there is a bearing face against the structure when there are problems related to tolerances of the

components. Optionally the shim may be a thermal shim. This may reduce the spread of fire to the internal building structure.

- Optionally, the method further comprising attaching an addition capping rail between shims. The capping rail may stop water from entering behind the masonry support angle element due to tolerance based problems.

Brief Description of Figures

Figure 1a shows a cross section of a masonry support angle element according to a first embodiment in situ between masonry and an internal building structure.

- Figure 1b shows the embodiment of Figure 1a with intumescent paint applied to prevent the spread of fire further. Figure 1b shows the paint in expanded form after exposure to heat.

Figure 1c shows a perspective view of the masonry support angle element of the first embodiment with additional stiffeners in place.

Figure 2 shows a series of images illustrating a method of installation, Figure 2a shows the join between a cavity tray and the masonry support angle close up.

- Figure 2b shows masonry support angle elements to which a cavity tray has been applied.

Figure 2c shows an additional masonry support angle element joined to the previous masonry support angle elements.

Figure 2d shows an additional infill cavity tray attached to the masonry support angle elements.

Figure 2e shows a completed masonry support structure.

- Figure 3a shows a cross section of the embodiment of Figure 1 in which a projecting system is used as the cursing level is below a predetermined level meaning that support extends down to the correct level.

Figure 3b shows the embodiment of Figure 3a with intumescent paint applied. Figure 3b shows the paint in expanded form after exposure to heat.

- Figure 4a shows a cross section of a second embodiment of the masonry support angle in which a support stiffener perpendicular to the proximal end, distal end, and connecting portion is used.

Figure 4b shows the embodiment of Figure 4a with intumescent paint applied. Figure 4b shows the paint in expanded form after exposure to heat.

Figure 5a shows a perspective view of the masonry support structure of Figure 4.

Figure 5b shows an additional masonry support angle element being added to the structure.

5 Figure 5c shows a cavity tray being applied to the additional masonry support angle element.

Figure 5d shows a completed masonry support structure according to this embodiment.

Figure 6a shows a cross section of a third embodiment of masonry support angle element.

Figure 6b shows the embodiment of Figure 6a with intumescent paint applied. Figure 6b shows the paint in expanded form after exposure to heat.

10 Figure 7a shows a perspective view of the masonry support angle element of Figure 6.

Figure 7b shows an additional masonry support angle element being added to the structure.

Figure 7c shows cavity trays being placed atop the masonry support angle elements.

Figure 7d shows a completed masonry support structure.

15 Figure 8 shows a cross section of any embodiment of masonry support structure shown above with a barrier tray positioned underneath the masonry support angle element. Figure 8 also shows intumescent paint in expanded form after exposure to heat.

Figure 9 shows an alternative barrier tray that may be used with any embodiment of masonry support angle element shown above.

20 Figure 10a shows a shim positioned between the masonry support angle element and the internal building structure.

Figure 10b is a perspective view of Figure 10a, and shows an capping rail jointed to the shim to it and protect the structure from water ingress.

Figure 11 shows a wall tie attached to the support stiffener of the masonry support angle element and the masonry.

25 Figure 12 is a flow diagram illustrating steps that may be used in the method of construction using the masonry support structure detailed above, in some embodiments to construct a building.

Description of Figures

Shown in the attached Figures are various embodiments of masonry support angle elements in masonry support structures. Each masonry support system comprises a first masonry support angle element comprising a distal end configured to act as a bracket to take load from masonry, the distal end configured to be in the horizontal position in use, a proximal end configured to be attached to a load bearing element of an internal building structure to transfer the load of the masonry to the load bearing element of the internal building structure, the proximal end being configured to be in the vertical position in use, and a connecting portion angled to connect the proximal and distal ends. The masonry support system also comprises a cavity tray configured to be positioned onto and to be affixed to the first masonry support angle element, the cavity tray comprising a proximal end configured to attach to the proximal end of the first masonry support angle element and configured to be vertical in use, a distal end configured to lie horizontal during use, and a connecting portion configured to connect the proximal and distal ends, the cavity tray configured to reduce water accumulation between the masonry and the internal building structure.

Figure 1a shows a cross section of a masonry support angle element 6 according to a first embodiment in situ between masonry and an internal building structure 4. The masonry 2 is shown as is the internal building structure 4. There is shown a masonry support angle element 6 comprising a distal end 8, a connecting portion 10, and a proximal end 12. The distal end 8 is configured to act as a bracket to take the load from the masonry 2. The masonry 2 is not configured to be load bearing and is effectively hung to the side of the internal building structure 4 via the masonry support angle element 6. There may be a masonry support at multiple floors of the building, and/or on every floor, and there may be additional fixations between the masonry and the internal building structure. The distal end 8 sits within a recess within the masonry 2. This recess may be in the structure of the masonry 2 itself, or may be formed from a movement joint or the like joining masonry 2 panels. The join between the distal end 8 and the connecting portion 10 is positioned proximate the masonry 2 (rather than proximate the internal building structure 4). This extends the connecting portion 10, and reduces the length of the distal end 8 that is flat. The effect of this is to reduce the area in which fluid may pool. Indeed, in this embodiment the masonry support angle element acts as a de facto cavity tray, and effectively replaces a larger cavity tray often seen in such systems. The infill cavity tray only is used for water ingress between the joint between such masonry support angle elements. The proximal end 12 is connected to the internal building structure 4 such that the load from the masonry 2 is held by the internal building structure 4. The proximal

end 12 is configured to be vertical during use (as shown in the Figure) whilst the distal end 8 is configured to be horizontal during use. The connecting portion 10 is angled to connect the distal end 8 and the proximal end 12. The connecting portion also acts to funnel fluid that has condensed down the slope.

- 5 The width of the channel or cavity may be between 100-400mm dependent on the size of the building. The join between the distal end and the connecting portion may be situated in the 25% of the channel closest to the masonry. This may be for example between 0-400mm for a wide channel, and between 0-10mm for a narrow channel. A typical channel will approximately 200m wide. For a typical channel the join will be less than 50mm from the
10 masonry element.

Figure 1b is identical to Figure 1a, other than the shaded area. This indicates the intumescent paint 14 may be applied to the structure and is shown in its expanded form (for example after exposure to heat or fire). In this case the intumescent paint 14 may be applied below the masonry support angle element 6 (and in particular in the triangle created below the
15 connecting portion 10). The paint may be applied directly to the masonry support angle element 6. The intumescent paint 14 is configured such that when exposed to heat it rapidly expands, thus filling the void. This reduces the amount of oxygen that the fire can consume, and therefore is intended to reduce the spread of fire through the building. The expanded paint also seals any gaps between components, preventing fire spread upwards. It also acts
20 to protect the support against fire, which would have a detrimental effect on its structural performance.

It is noted that intumescent paint is one material or substance that may be used to prevent fire. Other materials may also be used. For example, other expanding fire prevention materials may be used. These materials include for example rigid sheets of expanding fire prevention
25 material. Such rigid sheets of expanding fire prevention material may be bolted, or screwed, or otherwise suitably attached to the support structure, such as to the masonry support angle element. For the remainder of the application where intumescent paint is discussed it is noted that this may be replaced by any other fire prevention material such as those discussed herein.

Figure 1c shows a perspective view of the masonry support angle element 6 of the first
30 embodiment with additional stiffeners 18 in place. This shows the masonry support angle element 6, the distal end 8, the connecting portion 10, and the proximal end 12. Also shown are stiffeners 18 which are in place. These may for example be welded in place to increase strength where required.

It is noted that in this embodiment the cavity tray is an infill cavity tray. An infill cavity tray is a cavity tray that is utilised to joint components together while closing the necessary movement and tolerance gap between each structural support. It ensures that no moisture can penetrate between components. The masonry support angle element in this embodiment acts as both a support element and as a cavity tray, negating the need for a larger cavity tray element. The infill cavity tray is only used as the join between the masonry support angle elements may allow water ingress. The masonry support angle element of Figure 1 is therefore a single element providing a great array of functionality, allowing the construction of the support to be made less complex.

Figure 2 shows a series of images illustrating a method of installation, Figure 2a shows the join between a cavity tray 16 and the masonry support angle element 6 close up. This also shows the Adjustment system 36. This may be used in the attachment of the masonry support angle element 6 to the internal building structure 4. It allows for site adjustment in the vertical plane, and some minor adjustment in the horizontal plane. It may comprise an adjustable load-bearing bracket to which a clamping plate is engaged to enable the bracket to be secured to a support structure by means of a fastener such as a bolt. The clamping plate is designed to engage a bracket in a plurality of positions thereby enabling the position of the bracket relative to the masonry support angle element to be finely adjusted.

Figure 2b shows masonry support angle elements 6 to which an infill cavity tray 16 has been applied. An outer angle masonry support angle element 6 is shown. There may also be masonry support angle elements 6 in which there is no corner, or where there is an inner corner. The cavity tray 16 joins the masonry support angle elements 6 and prevents water ingress between the joints 20 between said elements 6.

Figure 2c shows an additional masonry support angle element 6 joined 20 to the previous masonry support angle elements 6. There is shown a join 20 between the masonry support angle elements 6 to which an infill cavity tray 16 has not yet been applied. This illustrates that this join 20 may be a source of water ingress, thus demonstrating the utility of the infill cavity tray 16. The cavity tray may be an infill cavity tray in this example. The masonry support angle elements 6 may be standard pieces constructed off site. As shown here they may simply clip together and are therefore simple to use in construction.

Figure 2d shows an additional infill cavity tray 16 about to be attached to the masonry support angle elements 6.

Figure 2e shows a completed masonry support structure. The infill cavity tray 16 is in place attached to both the first masonry support angle element 6 and the second masonry support angle element 6.

5 Figure 3a shows a cross section of the embodiment of Figure 1 in which a projecting system is used as the cursing level is below a predetermined level meaning that support extends down to the correct level. The connecting portion 10 is shown as being extended vertically in Figure 3 as compared with Figure 1a. This is because there is a protrusion 22. This may take any form such as notching around internal structure, SFS (steel frame system) or blockwork, where it is sat forwards compared to the internal building structure. This necessitates that the
10 masonry support angle element 6 attach at a different position on the internal building structure 4. The proximal end 12 therefore sits atop the projection 22. The load of the masonry 2 is therefore spread to a higher position on the internal building structure 4.

Figure 3b shows the embodiment of Figure 3a with intumescent paint 14 applied, and this paint is shown in the expanded form. As shown in Figure 1b the intumescent pain is shown
15 being applied below the masonry support angle element 6, and in particular below the connecting portion 10.

Figure 4a shows a cross section of a masonry support angle element according to a second embodiment in situ between masonry 2 and an internal building structure 4. The masonry 2 is shown as is the internal building structure 4. There is shown a masonry support angle element
20 6 comprising a distal end 8, a connecting portion 10, and a proximal end 12. The distal end 8 is configured to act as a bracket to take the load from the masonry 2. The masonry 2 is not configured to be load bearing and is effectively hung to the side of the internal building structure 4 via the masonry support angle element 6. As described with respect to Figure 1 there may be multiple points at which the masonry and the internal building structure are
25 connected. For example, a masonry support may be used on each floor, or on a subset thereof, and there may be other additional connection points. The distal end 8 sits within a recess within the masonry 2. This recess may be in the structure of the masonry 2 itself, or may be formed from a horizontal movement joint location or the like joining masonry 2 panels. The join between the distal end 8 and the connecting portion 10 is positioned proximate the internal
30 building structure 4. This may increase the strength of the masonry support angle element in combination with the support stiffener 18. Alternatively, the join between the distal end 8 and the connecting portion 10 may be situated nearer the masonry 2 as per the embodiment of Figure 1. The proximal end 12 is connected to the internal building structure 4 such that the load from the masonry 2 is held by the internal building structure 4. The proximal end 12 is

configured to be vertical during use (as shown in the Figure) whilst the distal end 8 is configured to be horizontal during use. The connecting portion 10 is angled to connect the distal end 8 and the proximal end 12. The connecting portion also acts to funnel fluid that has condensed down the slope. Figure 4a shows a support stiffener 18 perpendicular to each of the proximal end 12, distal end 8, and connecting portion 10 of the masonry support angle element 6. The support stiffener 18 extends vertically such that its highest point is at the same level as the highest point of the proximal end 12 of the masonry support angle element 6 (this may improve the strength of the masonry support angle element 6). However, in other embodiments the support stiffener may extend a different distance vertically. The support stiffener 18 increases the strength of the masonry support angle element 6 as it means there is less flexibility in the support, and increases the load it may bear. In this embodiment the support stiffener 18 does not extend the whole way to the masonry 2 (this may increase the efficiency of construction as the masonry does not have to be modified through the creation of a notch or recess, to allow for the support stiffener), however in other embodiment it may do so.

Figure 4b shows the embodiment of Figure 4a with intumescent paint 14 applied, and this paint is shown in the expanded form. This is shown as being applied below the masonry support angle element.

Figure 5a shows a perspective view of the masonry support structure of Figure 4. This shows the masonry support angle elements 6 including the support stiffeners 18, the distal end 8, the connecting portion 10, and the proximal end 12. The infill cavity trays 16 are also shown as connecting the masonry support angle elements and ensuring water does not ingress between said elements.

Figure 5b shows an additional masonry support angle element 6 being added to the structure. A join 20 between the masonry support angle elements 6 is shown. This join 20 may allow water ingress which may damage the structure. This shows the utility of the infill cavity trays 16.

Figure 5c shows an infill cavity tray 16 being applied to the additional masonry support angle element 6. The infill cavity tray 16 will be positioned over the join 20 between the masonry support angle elements 6.

Figure 5d shows a completed masonry support structure according to this embodiment. The infill cavity tray 16 is now shown over the join between the masonry support angle elements 6. It is noted that the masonry support angle elements 6 may comprise straight portions,

outside corner portions, or inside corner portions. The masonry support angle elements 6 may also be curved if the internal structure is curved. If the internal building structure is curved this may be approximated with a multi-sided polygon shape with as many flat sides as required to fit the curve.

5 Figure 6a shows a cross section of a third embodiment of masonry support angle element 6. In cross-section this looks very similar to the embodiment of Figure 1. The masonry 2 is shown as is the internal building structure 4. There is shown a masonry support angle element 6 comprising a distal end 8a, a connecting portion 10a, and a proximal end 12. The distal end 8a is configured to act as a bracket to take the load from the masonry 2. The masonry 2 is not
10 configured to be load bearing and is effectively hung to the side of the internal building structure 4 via the masonry support angle element 6. Additional connection points between the internal building structure and the masonry may exist, such as masonry support elements situated at other floors of the building. The distal end 8a sits within a recess within the masonry 2. This recess may be in the structure of the masonry 2 itself, or may be formed from a
15 horizontal movement joint location joining masonry 2 panels. The joint between the distal end 8 and the connecting portion 10 is positioned proximate the masonry 2 (rather than proximate the internal building structure 4). This extends the connecting portion 10a, and reduces the length of the distal end 8a that is flat. The effect of this is to reduce the area in which fluid may pool. The proximal end 12 is connected to the internal building structure 4 such that the
20 load from the masonry 2 is held by the internal building structure 4. The proximal end 12 is configured to be vertical during use (as shown in the Figure) whilst the distal end 8a is configured to be horizontal during use. The connecting portion 10 is angled to connect the distal end 8a and the proximal end 12. The connecting portion also acts to funnel fluid that has condensed down the slope.

25 Figure 6b shows the embodiment of Figure 6a with intumescent paint 14 applied, and this is shown with the paint in the expanded form. This is shown below the masonry support angle element 6, and in particular below the connecting portion 10.

Figure 7a shows a perspective view of the masonry support angle element of Figure 6. This shows the differences between the embodiment and that shown in Figure 1 more starkly. For
30 example, the connecting portion 10a is narrower than the distal end 8a. This significantly reduces the amount of material needed in the masonry support angle element 6. This reduction in material means that the weight of the masonry support angle element 6 is reduced significantly. This is especially the case as the masonry support angle element (for all of the embodiments described herein) is commonly made from metal, and commonly from steel. As

these materials are known to be dense reducing the quantity of material used means that the load on the internal building structure 4 as a result of the masonry support angle element 6 is reduced. This means that the building may have a longer lifetime, or that the internal building structure may have be simpler and less costly to construct as additional strengthening systems may not be required. This also may mean that installation of the masonry support angle element is significantly simpler as heavier items are typically harder to position on construction sites (especially into positions such as those required of masonry support elements). It is noted that in Figure 7a the proximal end 12 of the masonry support angle element 6 is also narrow. This further reduces the weight of the masonry support angle element 6. In other embodiments only the connecting portion 10a is narrow and the proximal end 12 is as wide as the distal end 8a.

Figure 7a also shows dotted lines on the masonry support angle element (specially on the distal end of the masonry support angle element). The dotted line show that the masonry support angle element can be separated out into separate individual 'brackets'. That is each portion of the masonry support angle element (for example each portion may correspond to a section with a single proximal element) may individually comprise a masonry support angle element, or these portions may together form a larger masonry support angle element. The dotted lines may be joins such as welds, or the larger element may be created as a single unit during manufacture.

Figure 7b shows an additional masonry support angle element 6 being added to the structure. Therefore, there are at least two separate masonry support angle elements shown in Figure 7b. The distal ends may be conjoined, or alternatively may be welded together during construction.

Figure 7c shows cavity trays 16 being placed atop the masonry support angle elements. The cavity tray has a continuous connecting portion such that the proximal end, distal end and connecting portion of the cavity tray are the same width as one another. The cavity tray 16 therefore stops moisture from accessing the gaps between the connecting portions of the masonry support angle elements 6. Overlapping cavity trays may be connected via any suitable means. For example, these cavity trays may be welded together, or bolts may be used, and the joint sealed with a capping element.

Figure 7d shows a completed masonry support structure. This shows that once completed embodiments one and three look very similar. The difference being the material in the masonry support angle element 6.

Figure 8 shows a cross section of any embodiment of masonry support structure shown above with a barrier tray 24 positioned underneath the masonry support angle element 6. The barrier tray 24 is configured to reduce or prevent the spread of fire through a building. The barrier tray provides a separate component specifically targeted at reducing fire. This means that the masonry support angle element may be protected, and that the masonry support angle element may be focussed more on masonry support in some embodiments. This may lower cost of production. Additionally in some embodiments as the channel between the internal building structure and the masonry façade contains air it may act as a chimney to transport heated vapours or hot air to other parts of the building. This can lead to fire quickly being transported across floors of the building. For this reason, the barrier tray 24 helps to prevent the spread of fire. The barrier tray 24 seals the floors from one another as it is positioned under the masonry support angle element 6. The barrier tray 24 may come in several forms. Figure 8 shows the barrier tray 24 in contact with the internal building structure 4. The portion of the barrier tray 24 in contact with the internal building structure forms a chevron 26 like shape. This means that the elbow of the chevron 26 is able to rest against the internal building structure 4, so that there is friction between the barrier tray and the internal building structure 4. The chevron is formed as this portion of the tray is relatively thin and so flexes. In some examples the barrier tray is made from a metal with a thickness of approximately 2mm. As the barrier tray is oversized for the space this flex then enables any gap to the internal building structure to be closed making the barrier tray secure. There may also be a direct attachment between the barrier tray 24 and the internal building structure 4, for example through a snap-fit mechanism. This design reduces the flow of hot air between floors. Moreover, the barrier tray 24 may be covered in intumescent paint 14 which will further reduce the spread of fire.

Figure 9 shows an alternative barrier tray 24 that may be used with any embodiment of masonry support angle element 6 shown above. In this example the barrier tray 24 is positioned entirely underneath the masonry support angle element 6. The barrier tray 24 may be welded to the underside of the masonry support angle element 6. The tray has integrated hooks so that the tray 24 is able to have a separate fire resistant apparatus or product attached thereto. This attachment may be formed on site or during construction. If a new fire product is launched it may also be retrofitted to an existing masonry support that is already in situ in the building.

Figure 10a shows a shim 28 positioned between the masonry support angle element 6 and the internal building structure 4. The shim 28 is configured to be adjustable for flexibility on site. The shim 28 is positioned directly between the masonry support angle element 6 and the

internal building structure 4 to allow for variations in the width of the cavity across the structure. In some embodiments the shim may be a thermal shim, and so may be configured to provide an additional barrier to prevent heat transfer to the internal building structure 4. This acts to further reduce the spread of fire between different floors of the building. The shim 5 28 may be manufactured from stainless steel, plastic, nylon, or composite material (composite materials tends to be best for thermal shims). Also shown in Figure 10a is a capping rail 30 (that may be known as an infill piece) that is situated between the shim 28 and the internal building structure 4 and forms a barrier above the shim to prevent water flowing down the surface of the internal building structure 4 from flowing down between the shim and the 10 internal building structure 4 – as this may cause damage. Instead water is caused to flow over the capping rail 30, and therefore can be channelled away from the internal building structure 4.

Figure 10b shows a capping rail 30 jointed to the shim 28 to cover it and protect them from water ingress. This is the same structure as shown in Figure 10a, Figure 10b shows this from 15 above to illustrate that no gap is left between the internal building structure 4 and the shim 28 by virtue of the infill cavity tray 30 which is configured to prevent water ingress into such a gap.

Figure 11 shows a wall tie 32 attached to the support stiffener 18 of the masonry support angle element 6 and the masonry 2. This is shown as being attached to a support stiffener 20 18 of the second embodiment. However, support stiffeners 18 may be added to the masonry support angle elements 6 of the other embodiments, and the wall tie 32 may be attached to such additional support stiffeners. The wall tie 32 acts to add further connection between the masonry support angle element 6 and the masonry 2 to keep the masonry 2 secure. The wall tie 32 may be situated between courses of masonry 2 that are to be joined via an adhesive 25 such as mortar, such that the mortar connects the wall tie 32 to the masonry 2. Alternatively, the wall tie 32 may attach to the masonry 2 via another means such as a snap fit mechanism. The wall tie 32 is connected to a vertical slot 34 in the support stiffener 18. The vertical slot 34 allows the position of the wall tie (in the vertical direction) to be adjusted dependent on the position of the masonry 2 so that the wall can best adjoin the masonry 2. The vertical slot 30 34 may also be positioned far enough from the edge of the support stiffener 18 so as to not weaken the edge of the support stiffener 18. Alternative arrangements to that shown in Figure 11 may comprise a wall tie 32 reaching directly back to the masonry support angle element 6. Such direct attachments may require welding, and may require the welding or attachment point to be covered to prevent water ingress.

It is noted that any protuberance, indent, or gap in the masonry support element in any embodiment may be covered by a cap element.

Figure 12 is a flow diagram illustrating steps that may be used in the method of construction using the masonry support structure detailed above, in some embodiments to construct a building. The first step 42 of Figure 12 comprises positioning a first masonry support angle element at an intended position adjacent an internal building structure. This masonry support angle element may comprise any of those described above. Adjacent the internal building structure is in an intended position such that the masonry support angle element may fulfil its purpose within the building once constructed.

10 The second step 44 comprises attaching the first masonry support angle element to the internal building structure. This attachment may be via any suitable means. For example, the masonry support angle element may be bolted to the internal building structure. Alternatively, some form of clip or attachment member may be used. This may create a steel to concrete connection – and hence bolting is often used.

15 The third step 46 comprises positioning a cavity tray over at least a portion of the first masonry support angle element. This may be in the manner as described in relation to Figure 1 such that a cavity tray is used to cover a join between two masonry support angle elements. Alternatively, this may be as set out with regard figure 7 (in relation to the third embodiment shown in Figure 6) in which the cavity tray overlays the masonry support angle element, and optionally two or more masonry support angle elements depending on the size of the cavity tray in question.

The final step 48 shown in Figure 12 comprises attaching the cavity tray to the first masonry support angle element. This attachment may be via any suitable means. For example, nuts and bolts, or other attachment means, or by welding the elements together.

25 One optional method step comprises positioning a second masonry support angle element at a second intended position adjacent the internal building structure, and adjacent the first masonry support angle element. This second masonry support angle element allows the masonry support structure to be extended so that it may cover a greater longitudinal distance. One further step therefore comprises attaching the second masonry support angle element to the internal building structure. This may be attached in any suitable way as set out above. One further step then comprises attaching the cavity tray to the second masonry support angle element, such that the cavity tray overlies at least part of both the first and second masonry support angle elements and is affixed to both. This attachment may be in any suitable manner

as set out above. The cavity tray overlaying part of both the first masonry support angle element and the second masonry support angle element allows the joint between the elements to be covered. This prevents water ingress between said joint, and therefore preserves the strength of the structure for a longer period, rendering the building more durable.

- 5 In one further step the method may comprise attaching the cavity tray to the internal building structure. This additional fastening may prevent movement of the cavity tray in the future if the attachment between the cavity tray and an additional element fails or becomes less rigid.

Caps may also be positioned over any attachment points or unused holes or indents to prevent water ingress. This improves the durability of the structure. The caps may be metallic, or may
10 be plastic or silicone. The caps may be attached in any suitable manner.

The method may comprise attaching a barrier tray beneath the first masonry support angle element such that it abuts the internal building structure. The attachment may be performed by welding the barrier tray to the masonry support angle element.

As set out in relation to figure 8 the barrier tray may comprise a chevron at the end that is
15 configured to abut the internal building structure. As part of the construction process the chevron may be adjusted to conform with the internal building structure. This adjustment may comprise pivoting any part of the chevron. This may involve heating the chevron such that it becomes more pliable before reducing the temperature of the chevron once the ideal shape is reached. As the barrier tray is effectively oversized for the space it is taking the barrier tray is
20 pressure fitted such that the chevron bends to allow the barrier tray to fit. This occurs as the barrier tray is constructed from thin gauge material.

The method may comprise attaching a wall tie to the support stiffener. The wall tie may be attached to the vertical slot of the wall stiffener as shown in Figure 11. The vertical height of the wall tie may then be adjusted by positioning it at the selected height based on the position
25 of the masonry. The wall tie may be attached to the masonry, for example via a mortar.

The method may comprise attaching a shim to the attachment point between the masonry support angle and the internal building structure. This may be attached via any suitable means to both the internal building structure and to the masonry support angle element. The shim may allow for variations in the channel width along the building which increases site tolerances.

30 The method may comprise attaching an additional capping rail between the shim and the internal building structure (or alternatively between the shim and the masonry support angle element).

This may be attached via any suitable means. The capping rail may prohibit water ingress around the shim which may cause damage to the building structure over time.

The method may comprise forming the masonry support structure off site into a single piece (or multiple pieces that may be simply connected together on-site) and shipping the combined
5 masonry support to the building site.

It is noted that features of each of the embodiments described above, specifically
embodiments one, two and three as described with reference to Figures 1, 4 and 6 each
contain features that may be combined with the features of the other embodiments. For
example, the support stiffener of the second embodiment may be utilised in either of the other
10 two designs. Additionally, the narrower connecting portion 10, and optional narrower proximal
end 12 of the masonry support angle element 6 of embodiment three may be utilised in either
of the other two embodiments. It is noted that these embodiments may be used in designs in
which all of the elements are straight, curved, or involve either external and/or internal corner
shapes.

15

Claims

1. A masonry support system comprising:

a first masonry support angle element (6) comprising a distal end (8) configured to act as a bracket to take load from masonry (2), the distal end (8) configured to be in the horizontal position in use, a proximal end (12) configured to be attached to a load bearing element of an internal building structure (4) to transfer the load of the masonry (2) to the load bearing element of the internal building structure (4), the proximal end (12) being configured to be in the vertical position in use, and a connecting portion (10) angled to connect the proximal (12) and distal ends (8); and

a cavity tray (16) configured to be positioned onto and to be affixed to the first masonry support angle element (6), the cavity tray (16) comprising a proximal end configured to attach to the proximal end (12) of the first masonry support angle element and configured to be vertical in use, a distal end configured to lie horizontal during use, and a connecting portion configured to connect the proximal and distal ends, the cavity tray (16) configured to reduce water accumulation between the masonry (2) and the internal building structure (4);

wherein the masonry support system further comprises a second masonry support angle element (6), the second masonry support angle element comprising a distal end (8) configured to act as a bracket to take load from masonry (2), the distal end (8) configured to be in the horizontal position in use, a proximal end (12) configured to be attached to a load bearing element of an internal building structure (4) to transfer the load of the masonry (2) to the load bearing element of the internal building structure (4), the proximal end (12) being configured to be in the vertical position in use, and a connecting portion (10) angled to connect the proximal (12) and distal ends (8); and

wherein the cavity tray is an infill cavity tray (16).

2. The masonry support structure of claim 1, wherein the infill cavity tray (16) is situated between the first and second masonry support angle elements (6), further optionally wherein the infill cavity tray (16) prohibits water from passing between the first and second masonry support angle elements (6).

3. The masonry support system of any preceding claim, wherein in use the distal portion (8) of the first masonry support angle element (6) is configured to be situated within a recess in the masonry, and wherein the join between the distal end (8) of the first masonry support

angle element (6) and the connecting portion (10) of the first masonry support angle element (6) is situated adjacent the masonry (2) during use.

4. The masonry support section of any of claims 1-3, wherein the distal end (8) of the first masonry support angle element (6) extends within a cavity between the masonry (2) and the internal building structure (4) during use, and wherein the join between the distal end (8) of the first masonry support angle element (6) and the connecting portion (10) of the first masonry support angle element (6) is positioned adjacent the internal building structure (2) during use.

5. The masonry support system of any preceding claim, wherein the connecting portion (10) of the first masonry support angle element (6) is the same width as the proximal (12) and distal ends (8) of the first masonry support angle element (6).

6. The masonry support system of any of claims 1-5, wherein the connecting portion (10) of the masonry support angle (6) element is narrower than distal end (8) of the masonry support angle element (6), and optionally wherein the connecting portion (10) of the masonry support angle element (6) is narrower than the proximal end (12) of the masonry support angle element (6), optionally wherein the distal portion (12) of the first masonry support angle element (6) is conjoined with the distal portion (8) of a neighbouring masonry support angle element (6), optionally wherein the distal portion (8) is fused with a third further neighbouring masonry support angle element (6), further optionally wherein a single cavity tray (16) affixes onto the top of the first masonry support angle element (6) and the neighbouring masonry support angle element (6), optionally wherein the cavity tray (16) affixes onto the top of a third further neighbouring masonry support angle element (6).

7. The masonry support system of any preceding claim, wherein the masonry support angle element (6) comprises a support stiffener (18) positioned to be perpendicular to each of the proximal (12), distal (8) and connecting portions (10).

8. The masonry support system of claim 7, wherein the support stiffener (18) provides strength to the masonry support system.

9. The masonry support system of any preceding claim, wherein at least a portion of said system is covered by a fire prevention material such as intumescent paint (14), or by a rigid fire prevention material that expands in the presence of fire.

10. The masonry support system of any preceding claim, further comprising caps over any indents, or holes to prevent water ingress.

11. The masonry support system of any preceding claim, wherein the cavity tray (16) is configured to be attached to the internal building structure (4).

12. The masonry support system of any preceding claim, further comprising a barrier tray (24) attached under the masonry support angle (6) such that in the event of fire the barrier tray (24) seals one floor from another to prevent spread, optionally wherein the barrier tray (24) is configured to abut the internal building structure (4), further optionally wherein a proximal end of the barrier tray (24) adjacent the internal building structure (4) forms a chevron (26), further optionally wherein the chevron (26) of the proximal end of the barrier tray (24) is configured to be adjustable for ease of installation, and/or further optionally wherein intumescent paint or a rigid material that expands in the presence of fire is applied to the barrier tray (24).

13. The masonry support system of claim 12, wherein the barrier tray (24) comprises hooks extending downwards from the tray, preferably wherein said hooks are integrated within the barrier tray (24).

14. The masonry support system of any preceding claim, further comprising a shim (28) configured to be positioned at the at the attachment points between the internal building structure (4) and the masonry support angle element (6), optionally further comprising an additional capping rail (30) between shims (28) to prevent water ingress.

15. The masonry support system of any preceding claim, further comprising a wall tie (32) coupled to the support stiffener (18), or to the proximal portion of the first masonry support angle element, optionally wherein the wall tie is attached to the support stiffener (18) through a vertical slot on the support stiffener (18), further optionally wherein the slot enables the height of the wall tie (32) to be adjusted in use to match the intended height of the masonry (2).

16. The masonry support system of any preceding claim, further comprising stiffening members attached to the masonry support angle element (6) to increase the load capacity of the masonry support angle element (6).

17. A method of installing the masonry support system of claims 1-16, the method comprising the steps of:

positioning a first masonry support angle element (6) at an intended position adjacent an internal building structure (4);

attaching the first masonry support angle element to the internal building structure;

positioning a cavity tray over at least a portion of the first masonry support angle

element;

attaching the cavity tray to the first masonry support angle element.

18. The method of claim 17, further comprising:

5 positioning a second masonry support angle element (6) at a second intended position adjacent the internal building structure (4), and adjacent the first masonry support angle element (6);

attaching the second masonry support angle element to the internal building structure;

10 attaching the cavity tray (16) to the second masonry support angle element, such that the cavity tray overlies at least part of both the first and second masonry support angle elements and is affixed to both.

19. The method of claims 17 or 18, further comprising attaching the cavity tray (16) to the internal building structure (4).

20. The method of any of claims 17 to 19, further comprising positioning caps over any attachment points or unused holes or indents to prevent water ingress.

21. The method of any of claims 17 to 20, further comprising attaching a barrier tray (24) beneath the first masonry support angle element such that it abuts the internal building structure, preferably wherein the attaching comprises welding, optionally further comprising adjusting the chevron (26) of the proximal end of the barrier tray to conform with the internal building structure (4).

22. The method of any of claims 17-21, further comprising attaching a wall tie (32) to the support stiffener (18).

23. The method of any of claims 17-22, further comprising attaching a shim (28) to the attachment point between the masonry support angle and the internal building structure, optionally further comprising attaching an addition capping rail (30) between shims.