MASONRY WALL SYSTEM

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ABSTRACT
The masonry block wall system comprises masonry blocks fastened together with interconnecting threaded steel fasteners. Four fasteners on each block connect with a pair of identical blocks immediately above and a pair of identical blocks immediately below the block. The resulting masonry wall is structurally sound and allows large vertical chases or conduits for electrical, plumbing and the like. Unlike conventional masonry, the construction of the present masonry wall does not require specialized knowledge and skill of a mason and is relatively easy to build. As well, the masonry wall system is not dependent upon weather during construction and can be de-constructed without demolition.
MASONRY WALL SYSTEM

FIELD OF THE INVENTION

[0001] The present invention relates to a masonry wall system in which masonry blocks are interconnected using threaded mechanical fasteners.

BACKGROUND

[0002] Masonry block walls are presently constructed using concrete blocks stacked on top of each other. The blocks are bonded together using cement mortar (both in the horizontal and vertical joints). A wire-reinforcing ladder is installed in the periodic horizontal joints. Construction of a masonry block wall requires a skilled mason. The construction of a masonry block wall requires a controlled environment while the cement mortar cures.

[0003] In conventional masonry construction, the designer (the design engineer) has few means of knowing that the block wall is built in accordance with the designer specifications, for example: the mortar being correctly installed and having adequate strength, the concrete filled cores being completely filled and the reinforcing steel being placed correctly or being installed at all. The designer has to rely heavily on the integrity of the mason and the mason’s workers that the masonry wall was properly built.

[0004] Traditional masonry units have vertical chases or conduits for installing plumbing lines, electrical conduits, and other building services, but the vertical holes are often small and are commonly filled with cement grout or concrete and thus very often not continuous from top to bottom.

[0005] U.S. Pat. No. 1,499,483 (Simms), U.S. Pat. No. 5,685,119 (Zschoppe), U.S. Pat. No. 5,899,040 (Cerrato) and U.S. Pat. No. 6,244,009 (Cerrato) disclose various examples of a wall construction using masonry type blocks. In each instance, the block has an irregular shape for interlocking connection with adjacent blocks. The blocks thus require complex molds for manufacturing. Rods are used in some instances for interconnecting adjacent blocks, however the rods are intended to span plural rows resulting as a wall which permits some relative movement between the blocks. This relative movement is typically undesirable in a large static structure.

[0006] U.S. Pat. No. 5,787,675 (Futagi) discloses a log wall construction in which mechanical fasteners are used for interconnecting the logs of the wall. The fasteners include a washer formed integrally therewith which has cleats for bearing into the logs being fastened. The configuration of the cleats would interfere with the use of the fasteners on a masonry wall construction.

SUMMARY OF THE INVENTION

[0007] According to one aspect of the invention there is provided a masonry block for use with threaded masonry fasteners, the block comprising:

[0008] a rectangular body which is elongate in a longitudinal direction extending between ends of the body, the body having a pair of opposing, upright side walls spanning in the longitudinal direction between the ends; and

[0009] fastener apertures formed through the rectangular body to extend from a top side to a bottom side of the block for receiving the threaded masonry fasteners therethrough;

[0010] at least some of the fastener apertures being spaced from one another in a lateral direction extending between the opposing, upright side walls of the body.

[0011] By providing fastener apertures which are spaced apart from one another in a lateral direction extending between the opposing upright side walls of the block, the support area joining each block to the previous row is wider across the thickness of the wall structure to more evenly anchor each block to the previous rows. Furthermore the fasteners joining the rows are mounted closer to the outer walls under tension so that the fasteners provide better support to resist bending forces of the wall in either lateral direction.

[0012] According to a second aspect of the present invention there is provided a masonry block for use with threaded masonry fasteners, the block comprising:

[0013] a rectangular body which is elongate in a longitudinal direction between ends of the body, the body having a pair of opposing, upright side walls spanning in the longitudinal direction between the ends and a pair of web portions spanning in a lateral direction between the opposing, upright side walls;

[0014] a central conduit extending through the body from a top side to a bottom side of the body between the web portions;

[0015] a pair of partial conduits extending through the body from the top side to the bottom side of the body at the ends of the body, each partial conduit being located between a respective one of the web portions and a respective one of the ends of the body and substantially comprising half of a cross-sectional area of the central conduit; and

[0016] fastener apertures formed through the rectangular body to extend from the top side to the bottom side of the block for receiving the threaded masonry fasteners therethrough.

[0017] Construction of the block to include a pair of webs spanning between opposing side walls to define a central conduit therebetween and a pair of partial conduits at the ends of the block, results in an advantageous location of the fasteners in the webs being located approximately a quarter of the length of the block from each end of the block. In this configuration each block is connected to a pair of adjacent and overlapped blocks in the previous row by a fastener which is centrally located within the area of overlap between the blocks for optimum distribution of loads.

[0018] According to another aspect of the present invention there is provided a masonry block in combination with threaded masonry fasteners:

[0019] the masonry block comprising a rectangular body and fastener apertures formed in the rectangular body to extend from a top side to a bottom side of the block; and

[0020] each masonry fastener comprising:

[0021] an elongate body substantially corresponding in length to a height between the top and bottom sides of the block;

[0022] an externally threaded portion near a bottom end of the elongate body;
[0023] a nut portion formed near a top end of the elongate body; and

[0024] an internally threaded bore formed in the nut portion at the top end of the elongate body which is suitably sized to operatively receive the externally threaded portion of an additional masonry fastener of identical configuration.

[0025] The fasteners described herein are suitably arranged to span only a single row of blocks in the preferred embodiment. In this arrangement a much simpler block construction can be used as the blocks do not require any additional interlocking or alignment mechanism to connect to the previous row other than simply aligning the fasteners from one row to the next. The simplicity of the block design reduces manufacturing costs of the block when only fastener apertures are required and the top and bottom faces of the block can remain substantially flat and free of complex interlocking shapes. The fasteners are much easier to align with a previous row of fasteners when assembling only a single row at a time.

[0026] According to another aspect of the present invention there is provided a masonry wall system comprising rows of masonry blocks supported one above the other to form a wall structure in which each masonry block is connected to at least one masonry block immediately therebelow by at least one respective masonry fastener.

[0027] each masonry block comprising a rectangular body and at least one fastener aperture formed in the rectangular body to extend from a top side to a bottom side of the block and receiving said at least one respective masonry fastener therethrough; and

[0028] each masonry fastener comprising:

[0029] an elongate body;

[0030] a nut portion adjacent a top end of the elongate body which engages a top side the respective masonry block;

[0031] an internally threaded bore formed in the nut portion at the top end of the elongate body; and

[0032] an externally threaded portion near a bottom end of the elongate body in mating engagement with the internally threaded bore of the respective masonry fastener received through said at least one masonry block immediately therebelow.

[0033] According to yet another aspect of the present invention there is provided a corner block comprising:

[0034] a body having a first rectangular portion and a second rectangular portion which are formed integrally with one another;

[0035] the first rectangular portion having upright side walls which are elongate in a longitudinal direction between ends of the first rectangular portion and dimensions between top and bottom sides and between the upright side walls which are substantially identical to the masonry blocks;

[0036] the second rectangular portion having upright side walls extending outward from the first rectangular portion in a lateral direction oriented perpendicularly to the longitudinal direction of the first rectangular portion and having dimensions between top and bottom sides and between the upright side walls which are substantially identical to the first rectangular portion;

[0037] one of the side walls of the second rectangular portion being flush with one end of the first rectangular portion; and

[0038] a difference between dimension of the corner block in the longitudinal direction thereof and dimension of the corner block in the lateral direction thereof corresponding to approximately half a total length of the masonry blocks in the longitudinal direction thereof.

[0039] According to a further aspect of the present invention there is provided a method of assembling a masonry wall on a supporting surface, the method comprising:

[0040] providing a plurality of masonry blocks, each comprising a rectangular body and fastener apertures formed in the rectangular body to extend from a top side to a bottom side of the block;

[0041] providing a plurality of masonry fasteners, each comprising an elongate body; a nut portion integrally formed near a top end of the elongate body; an internally threaded bore formed in the nut portion; and an externally threaded portion near a bottom end of the elongate body;

[0042] forming a first row of blocks by placing the masonry blocks sequentially in an end to end configuration along the supporting surface;

[0043] connecting each of the masonry blocks of the first row to the supporting surface using the masonry fasteners by inserting each externally threaded portion through a respective fastener aperture until the nut portion engages the top side of the respective block and the externally threaded portion is anchored to the supporting surface; and

[0044] forming subsequent rows of blocks in which each subsequent row is formed by:

[0045] placing the masonry blocks sequentially in an end to end configuration along a previous row of blocks with the fastener apertures of the masonry blocks being aligned with respective fastener apertures of the previous row of blocks; and

[0046] connecting each of the masonry blocks to the masonry blocks of the previous row of blocks using the masonry fasteners by inserting each externally threaded portion through a respective fastener aperture until the nut portion engages the top side of the respective block and the externally threaded portion is threadably received in the internally threaded bore of the respective masonry fastener in the previous row of blocks.

[0047] Preferably at least some of the fasteners are spaced in the longitudinal direction relative to one another in addition to being spaced in the lateral direction. Also preferably, some or all of the fastener apertures are located adjacent respective side walls of the block in the web portions.

[0048] Each fastener aperture preferably includes a counter bore formed at the bottom side of the block wherein a length and a diameter of the counter bore are respectively equal to or greater than a length and a diameter of the nut portion of the fastener. The counter bores and the nut
portions of the fasteners may be near one another in diameter for snugly receiving the nut portion of one of the fasteners in each counter bore. In some embodiments, the counter bore may increase in diameter towards the bottom side of the body.

[0049] There may be provided a flat washer between the nut portion and the externally threaded portion which is greater in diameter than the counter bore and which is formed integrally with the nut portion.

[0050] A pair of laterally spaced fastener apertures may be spaced from each end of the block by approximately \( \frac{1}{2} \) % of a total length of the block in a longitudinal direction of the block for alignment of the fastener apertures when the blocks are stacked to overlap half a block length of the blocks immediately therebelow.

[0051] The masonry block may be used in combination with a shear plate spanning at least partway across one of the top or bottom sides of the body. The shear plate preferably includes a pair of apertures formed therein which are aligned with a pair of the fastener apertures in the body which are spaced from one another in the lateral direction.

[0052] There may also be provided a channel extending in the longitudinal direction along one of the top and bottom sides of the block for receiving an elongate reinforcement bar therein in a horizontal direction across a plurality of blocks.

[0053] The method of assembling a masonry wall described herein may include forming a supporting surface of concrete with some of the masonry fasteners embedded therein for alignment with the fastener apertures of the first row of blocks and anchoring the masonry fasteners received in the first row of blocks to the masonry fasteners embedded in the concrete.

[0054] As described herein, the masonry wall system results in a mortarless block wall comprising concrete block units that are connected together with steel connectors. The steel connectors main purposes are to provide tensile strength to the wall to resist bending stresses (created from lateral loads such as wind and eccentric vertical wall loading). The block walls are placed on top of the lower course of masonry units (the vertical joints are stagger from the block course below—running bond). The steel connectors also serve a secondary purpose of providing a guide for the masonry block units being placed.

[0055] The masonry wall system of the present invention (or mortarless block wall) possesses numerous benefits and advantages over the traditional masonry wall construction. Most significantly, the mortarless block wall can be built without the specialized skills and knowledge of a mason. As well, the mortarless block wall can be constructed in any weather conditions without affecting its structural integrity (unlike traditional masonry wall construction that is affected by weather condition that in turn affects its structural integrity such as frozen mortar in cold weather, baked mortar in hot weather or dried mortar in windy weather). As well, as the mortarless block wall is constructed it has immediate structural strength (unlike conventional masonry construction, which only has strength after the cement mortar has cured). Having instantaneous strength is beneficial when the walls are exposed to construction in windy conditions. Another benefit to the mortarless block wall is that the construction can be de-constructed by simply reversing the construction process. The masonry block units and the metal connectors can be re-used over and over again.

[0056] The mortarless block wall is lighter than traditional block walls and the walls have greater resistance to wind loads (both positive pressure loads and negative suction loads). As well, the mortarless block wall has greater horizontal shear resistance than traditional block walls (which relies on the strength of the cement mortar).

[0057] The mortarless block wall requires the use of the masonry fasteners of the present invention to work properly and so there is no incentive or means for the wall builder to skimp on material or do shoddy workmanship.

[0058] Another advantage of the mortarless masonry block is that it has large continuous vertical holes in the center. These holes can be used for installing plumbing lines, electrical conduits and other building services and won’t get plugged with mortar or concrete when installed due to the use of the masonry fasteners according to the present invention.

[0059] The masonry block wall’s vertical holes must line up vertically and in fact are guide for the proper placement of the block units.

[0060] One embodiment of the invention will now be described in conjunction with the accompanying drawings in which:

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0061] FIG. 1 is a perspective view of the masonry wall system.

[0062] FIG. 2 is a front elevational view of the masonry wall system.

[0063] FIG. 3A and FIG. 3B are respective exploded and assembled elevational view of the masonry fastener for use in the masonry wall system.

[0064] FIG. 4 is a perspective view of the masonry block for use in the masonry wall system.

[0065] FIG. 5 is a bottom plan view of the masonry block.

[0066] FIG. 6 is a side elevational view of the masonry block.

[0067] FIG. 7 is a sectional view of the masonry wall system along the line 7-7 of FIG. 2.

[0068] FIG. 8 is a perspective view of the shear plate for use in the masonry wall system.

[0069] FIG. 9 is a perspective view of the masonry wall system with the fasteners and the shear plates shown removed.

[0070] In the drawings like characters of reference indicate corresponding parts in the different figures.

**DETAILED DESCRIPTION**

[0071] Referring to the accompanying figures there is illustrated a masonry wall system generally indicated by reference numeral 10. The system 10 includes a plurality of masonry blocks 12 which are mechanically coupled to one another using masonry fasteners 14 as described herein.
Each masonry block 12 comprises a rectangular body of pre-cast concrete which is elongate in a longitudinal direction between opposing ends 16 of the body. The height and width in a lateral direction perpendicular to the longitudinal direction are approximately equal to one another, having dimensions each of approximately 200 millimetres while the length is approximately double. The blocks each include opposing, upright and flat side walls 18 extending longitudinally between the ends and which form the surfaces of the wall structure being formed when the blocks are stacked on top of one another. Each block also includes a flat top side 19 and a flat bottom side 20 which permits stacking of the blocks on top of the other.

Each block includes a centrally located conduit 24 of generally octagonal cross section and having a lateral dimension which is more than half of the width of the block. The conduit 24 extends through the block from the top side to the bottom side thereof. The conduit is centered both laterally and longitudinally.

Each end 16 of the block also includes a partial conduit 26 which comprises a channel open to the exterior end of the block and which is shaped to correspond to half of the cross sectional shape of the central conduit 24. Accordingly when two blocks are abutted in an end to end configuration two partial conduits 26 are opened to one another and form an assembled conduit which is identical in cross section to the central round conduit 24.

Two webs 28 are integrally formed in each block to span in the lateral direction between the opposing side walls 18 of the block to divide the central conduit 24 from each of the partial conduits 26 at opposing ends of the block. Each web 28 is located spaced from a respective end of the block by approximately one quarter of a total length of the block in the longitudinal direction. Accordingly, the fastener apertures of the two webs are spaced apart from one another approximately twice the distance of the spacing of each fastener aperture from the respective end of the block.

Each masonry fastener 14 has a height which substantially corresponds in length to a height of the block between the top and bottom sides thereof so that the fastener spans the height of the block, but with some additional length for overlapping in a lengthwise direction the fastener of an adjacent row of blocks stacked thereupon when the fasteners are engaged with one another in a mating connection.

The fastener 14 includes an elongate shaft 33 having an external threaded portion 34 at both the bottom end and the top end. Diameter of the shaft 33 and threaded portions 34 is approximately equal to the diameter of the through bore of the fastener apertures 30 for slidably receiving the fasteners within the apertures in use. The external threaded portion 34 comprises a machine screw for threaded securingment to a suitable mating nut.

A nut portion 36 is provided for mounting at the top end of the shaft 33. The nut portion has a hexagonal cross section similar to conventional nuts for example for gripping with a wrench or socket tool and the like. Length and diameter of the nut portion 36 is approximately equal to or less than the respective length and diameter of the counter bore 32 so that the nut portion is receive within the counter bore when stacking blocks. The through bore and counter bore of the fastener apertures 30 are close enough in dimensions to the shaft defining the threaded portion 34 and the nut portion 36 of the masonry fasteners to provide a snug fit of the fasteners within the apertures to maintain proper alignment of the masonry blocks 12 relative to adjacent blocks. The increasing dimension of the counter bore provides ease of insertion at the outer end while snugly receiving the nut portion at the inner end where the nut portion and counter bore are near one another in diameter for aligning the blocks relative to one another.

The nut portion 36 includes an internally threaded bore 38 therethrough from the bottom end to the top end which is suitably sized for mating engagement with the threaded portion 34 at the top end of the respective shaft 33 and for mating engagement with threaded portion 34 at the bottom end of another masonry fastener 14 of identical configuration. A dimple is centrally located within the internally threaded bore in the nut portion for engaging the top end of the respective shaft 33 inserted therein and prevent over-threading of the shaft beyond a longitudinal centre of the nut portion.

A washer 40 is located between the nut portion 26 and the shaft 33 when assembling the nut portion on the shaft for abutment against the top side of the masonry block 12 which receives the threaded portion 34 through one of the fastener apertures 30 therein. An engaging surface of the washer 40, which faces the threaded portion and which lies perpendicular to a longitudinal direction of the fastener, is flat for abutment with the top side of the masonry block 12.

In further embodiments, the shaft 33, the nut portion 26 and the washer may be formed as an integral body,
in which the shaft is externally threaded at one end of the body and the nut portion 26 is internally threaded at the opposing end of the body.

[0084] When assembling a wall structure, shear plates 50 are mounted to span between opposed pairs of the fasteners where additional shear strength is desired. Each shear plate 50 comprises a flat plate of rigid metal which has a length which is near the width of the blocks 12 in the lateral direction. The plates 50 have a width which is only slightly greater than the webs 28 so that the conduits remain substantially unobstructed when the shear plates are mounted to span the top side of respective blocks 12 in alignment with respective webs 28. The shear plates 50 span across a laterally spaced pair of the apertures 30 in the blocks and each include a respective pair of mounting apertures 52 therein. The mounting apertures 52 are spaced apart from one another by the same lateral spacing as the apertures in the blocks 12 for alignment therewith. The apertures 52 in the plate 50 have a diameter which closely fits the shaft 33 of the fasteners 14 therein so that the shear plates are commonly mounted with the blocks 12 to a previous row of blocks during assembly.

[0085] As best shown in FIG. 9, a channel 54 is formed in the top side of each block, also when additional strength is desired. The channel 54 extends a full length of the block in the longitudinal direction, centrally located in the lateral direction between the side walls 18. The channel 54 comprises a groove open to the top side of the block and which is suitably sized for receiving an elongate reinforcement member, commonly referred to as rebar, to extend through the channel and span a plurality of blocks along a given row of the wall structure. The reinforcement member is received in the channel 54 prior to attachment of the shear plates 50 so that the shear plates enclose the open top end of the channel 54 at web 28 once installed.

[0086] As shown in FIGS. 1 and 9, a corner block 60 is provided for joining to linearly assembled wall structures at right angles to one another. The corner block 60 has a body having a first rectangular portion 62 and a second rectangular portion 64 which are formed integrally with one another.

[0087] The first rectangular portion 62 has upright side walls 66 which are elongate in a longitudinal direction between end 68 of the first rectangular portion. Dimensions of height between top and bottom sides and width in the lateral direction between the upright side walls which are substantially identical to the masonry blocks 12 described above.

[0088] The second rectangular portion 64 also has upright side walls 66, but the side walls of the second rectangular portion extend outward from the first rectangular portion in a lateral direction oriented perpendicularly to the longitudinal direction of the first rectangular portion. The second rectangular portion has dimensions of height between top and bottom sides and of width between the upright side walls which are substantially identical to the first rectangular portion.

[0089] The first rectangular portion 62 corresponds in length to 1 and 1/2 times a length of the blocks 12 in the longitudinal direction. Two complete conduits are provided in the first rectangular portion with a partial conduit being provided at only one end. The opposing end is enclosed by a flat end wall and is joined with the second rectangular portion so that one of the side walls of the second rectangular portion is flush with the enclosed end of the first rectangular portion.

[0090] The second rectangular portion 64 corresponds in length to 3/4 a length of the blocks 12 in the longitudinal direction thereof. Accordingly, a difference between dimension of the corner block in the longitudinal direction thereof and dimension of the corner block in the lateral direction thereof corresponds to approximately 1/2 a total length of the masonry blocks 12 in the longitudinal direction thereof. Accordingly, by alternating position of the first and second rectangular portions of the corner block with each successive row, the blocks 12 abutted with the corner block at each row will be offset by 1/2 a length of a block in relation to the blocks of the adjacent rows thereabove and therebelow.

[0091] Using the masonry wall system 10, a wall structure can be erected in which masonry blocks 12 are mechanically joined by masonry fasteners 14 as described herein. A base of concrete 42 is first formed where the wall is to be erected. Fasteners 14 are embedded in the concrete when the concrete is still wet. The fasteners 14 are embedded such that the threaded portion 34 is embedded into the concrete but the nut portion extends above the top surface of the concrete. A retention nut 44 can be secured to the bottom end of the bottom threaded portion 34 prior to insertion of the fasteners into the wet concrete. The fasteners are suitably spaced from one another for alignment with the fastener apertures 30 of the first row of blocks to be formed.

[0092] The first row is formed by placing the blocks in an end to end configuration in a longitudinal direction of the blocks so that the partial conduits 26 of each block join with those of adjacent blocks to form complete conduits. The counter bores 32 are inserted overtop of the nut portions which project up and outwardly from the concrete base 42 once the base has cured. The blocks in the first row are secured in place by inserting the threaded portion 34 of a masonry fastener 14 into each of the fastener apertures 30 so that the bottom end is matingly engaged with the internally threaded bore 38 of the fasteners embedded in the concrete therebelow.

[0093] As the fasteners 14 received through the blocks are threaded into the fasteners therebelow and tightened in place, the washer 40 and nut portion 36 thereabove clamp down on to the top side of the blocks. The close fit of the fasteners with respect to the through bore and counter bore of the fastener apertures 30 assists in proper alignment of the masonry blocks.

[0094] Each subsequent row is placed above the previous row by sequentially placing the masonry blocks in an end to end configuration in a longitudinal direction of the blocks along the previous row. The first block is positioned so as to be offset in a longitudinal direction by half a block length relative to the previous row to form a staggered pattern. Due to the spacing of the conduits and fastener apertures, each pair of joined partial conduits 26 aligns with a central round conduit 24 of the rows thereabove and therebelow.

[0095] Similarly, the fastener apertures of each masonry block align with fastener apertures of two separate blocks in the rows immediately above and below. As each subsequent
row is formed, the masonry fasteners inserted therein are threadably engaged with the fasteners of the previous row and tightened until the nut portion thereof clamps down onto the top surface of the respective blocks. The location of the masonry fasteners permits the first row of blocks to be anchored to the concrete base forming a supporting surface of the wall while each block in the subsequent rows is anchored to two adjacent blocks in the row above and two adjacent blocks in the row below. Accordingly, the finished wall structure includes blocks which are sufficiently interconnected by mechanical fasteners to be self supporting without any grout material being required to join the blocks.

[0096] As described herein, the masonry wall system 10 (or morturless block wall) consists of a masonry block 12 and a masonry fastener 14 comprising a steel connector. Construction of the block wall starts with first installing a connector to a concrete base (concrete wall, slab, footing, etc) with a base steel connector. This base steel connector is either installed in wet concrete (not hardened yet) or installed in cured concrete (hardened concrete). If the base steel connector is installed in wet concrete, a nut is placed at the end of the steel connector to increase the tensile anchor strength of the steel connector. If the steel connector is installed in cured concrete, then an oversized hole is drilled in the concrete and the connector is installed with an epoxy grout in the hole with the connector. In either installation of the base connector, care is required to place the connector in the correct location.

[0097] Once the base connector is installed, the standard masonry blocks 12 are installed over the base connector. The standard steel connectors are then inserted in the top of the masonry block (or unit) and after the wall has been straightened and plumbed, the steel connectors are tightened snug. After the first masonry course is placed the second course is installed and again the steel connectors are inserted in the top of the masonry unit. Again after the second course of masonry units have been straightened and plumbed, the steel connectors are tightened snug. The process is continued until the full height of the wall is completed.

[0098] A form can be placed at the ends of the wall, or at an opening, etc and the rough openings or ends of the wall can be finished with concrete. To achieve a greater fire resistance in the mortarless block wall, the vertical and horizontal joints in the wall can be caulked with a fire retardant caulk. The caulk serves another purpose, to straighten out vertical block unevenness.

[0099] The wall system as described herein is advantageous to owners as compared to conventional masonry walls as it is typically less expensive, faster to construct, and can be de-constructed and reused. Advantages to contractors include: (1) Does not need hoarding & (or cooler weather) to construct, (2) Less skilled labour to construct the wall, (3) The project schedule is not dictated by a masonry contractor, (4) Installation of plumbing line & electrical conduit can be done after wall is constructed (the vertical cores within the wall are continuous), (5) The wall has instant structure strength when the connectors are tightened (and so temporary lateral bracing is less likely), and (6) Construction of the wall can be done with only access with one side of the wall (and still achieve a similar exterior finish quality). Advantages to Architects and Engineers include: (1) More consistent quality in structural strength than a concrete or masonry wall, (2) Stronger lateral & vertical load capacity than a masonry wall, (3) More consistent wall strength than a concrete or masonry wall, (4) Better surface finish, and (4) More durable block than a standard masonry block.

[0100] Since various modifications can be made in my invention as herein above described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departure from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

1. A masonry block for use with threaded masonry fasteners, the block comprising:

   a rectangular body which is elongate in a longitudinal direction extending between ends of the body, the body having a pair of opposing, upright side walls spanning in the longitudinal direction between the ends; and

   a fastener apertures formed through the rectangular body to extend from a top side to a bottom side of the block for receiving the threaded masonry fasteners therethrough;

   at least some of the fastener apertures being spaced from one another in a lateral direction extending between the opposing, upright side walls of the body.

2. The block according to claim 1 wherein at least some of the fasteners are spaced in the longitudinal direction relative to one another.

3. The block according to claim 1 wherein the fastener apertures are located adjacent the side walls.

4. The block according to claim 1 wherein a pair of the fastener apertures spaced from one another in the lateral direction are spaced from each end of the body by approximately ¼ of a total length of the body in the longitudinal direction.

5. The block according to claim 1 wherein a pair of the fastener apertures spaced from one another in the lateral direction are spaced from each end of the body by approximately ¼ of a total length of the body in the longitudinal direction.

6. The block according to claim 1 in combination with a plurality of threaded masonry fasteners, each fastener comprising:

   an elongate body substantially corresponding in length to a height between the top and bottom sides of the block;

   an externally threaded portion near a bottom end of the elongate body;

   a nut portion formed near a top end of the elongate body; and

   an internally threaded bore formed in the nut portion at the top end of the elongate body which is suitably sized to operatively receive the externally threaded portion of an additional masonry fastener of identical configuration;

   wherein the fastener apertures each include a counter bore of increased diameter formed at the bottom side of the body, the counter bores and the nut portions being near one another in diameter for receiving the nut portion of one of the fasteners in each counter bore.
7. The block according to claim 1 wherein each fastener aperture includes a counter bore formed at the bottom side of the body, the counter bore increasing in diameter towards the bottom side of the body.

8. The block according to claim 1 in combination with a shear plate spanning at least partway across one of the top or bottom sides of the body, the shear plate including a pair of apertures formed therein which are aligned with a pair of the fastener apertures in the body which are spaced from one another in a lateral direction.

9. A masonry block for use with threaded masonry fasteners, the block comprising:

a rectangular body which is elongate in a longitudinal direction between ends of the body, the body having a pair of opposing, upright side walls spanning in the longitudinal direction between the ends and a pair of web portions spanning in a lateral direction between the opposing, upright side walls;

a central conduit extending through the body from a top side to a bottom side of the body between the web portions;

a pair of partial conduits extending through the body from the top side to the bottom side of the body at the ends of the body, each partial conduit being located between a respective one of the web portions and a respective one of the ends of the body and substantially comprising half of a cross-sectional area of the central conduit; and

fastener apertures formed through the rectangular body to extend from the top side to the bottom side of the block for receiving the threaded masonry fasteners therethrough.

10. The block according to claim 9 wherein the fastener apertures are located in each web portion of the body.

11. The block according to claim 9 wherein at least some of the fastener apertures being spaced from one another in a lateral direction extending between the opposing, upright side walls of the body.

12. The block according to claim 9 in combination with a plurality of threaded masonry fasteners, each fastener comprising:

an elongate body substantially corresponding in length to a height between the top and bottom sides of the block;

an externally threaded portion near a bottom end of the elongate body;

a nut portion formed near a top end of the elongate body;

and

an internally threaded bore formed in the nut portion at the top end of the elongate body which is suitably sized to operatively receive the externally threaded portion of an additional masonry fastener of identical configuration;

wherein the fastener apertures each include a counter bore of increased diameter formed at the bottom side of the body, the counter bores and the nut portions being near one another in diameter for receiving the nut portion of one of the fasteners in each counter bore.

13. The block according to claim 9 wherein each fastener aperture includes a counter bore formed at the bottom side of the body, the counter bore increasing in diameter towards the bottom side of the body.

14. A masonry block in combination with threaded masonry fasteners:

the masonry block comprising a rectangular body and fastener apertures formed in the rectangular body to extend from a top side to a bottom side of the block; and

each masonry fastener comprising:

an elongate body substantially corresponding in length to a height between the top and bottom sides of the block;

an externally threaded portion near a bottom end of the elongate body;

a nut portion formed near a top end of the elongate body; and

an internally threaded bore formed in the nut portion at the top end of the elongate body which is suitably sized to operatively receive the externally threaded portion of an additional masonry fastener of identical configuration.

15. The combination according to claim 9 wherein the fastener apertures each include a counter bore of increased diameter formed at the bottom side of the body for receiving the nut portion of one of the fasteners in each counter bore.

16. The combination according to claim 15 wherein the counter bores and the nut portions are near one another in diameter.

17. The combination according to claim 15 wherein each counter bore increases in diameter towards the bottom side of the body.

18. A masonry wall system comprising rows of masonry blocks supported one above the other to form a wall structure in which each masonry block is connected to at least one masonry block immediately therebelow by at least one respective masonry fastener:

each masonry block comprising a rectangular body and at least one fastener aperture formed in the rectangular body to extend from a top side to a bottom side of the block and receiving said at least one respective masonry fastener therethrough; and

each masonry fastener comprising:

an elongate body;

a nut portion adjacent a top end of the elongate body which engages a top side of the respective masonry block;

an internally threaded bore formed in the nut portion at the top end of the elongate body; and

an externally threaded portion near a bottom end of the elongate body in mating engagement with the internally threaded bore of the respective masonry fastener received through said at least one masonry block immediately therebelow.

19. The system according to claim 18 wherein each fastener aperture includes a counter bore formed at the bottom side of the block, the counter bore snugly receiving the nut portion of a respective fastener therein.

20. The system according to claim 18 wherein each block is elongate in a longitudinal direction and includes opposing, upright side walls spanning in the longitudinal direction of the block, at least some of the fastener apertures being spaced from one another in a lateral direction extending between the side walls of the block.
21. The system according to claim 20 wherein there is provided a shear plate spanning at least partway across one of the top and bottom sides of the block, the shear plate including a pair of apertures formed therein which are aligned with a pair of the fastener apertures in the body which are spaced from one another in the lateral direction.

22. The system according to claim 18 wherein each block is elongate in a longitudinal direction and wherein there is provided a channel extending in the longitudinal direction along one of the top and bottom sides of the block for receiving an elongate reinforcement bar therein.

23. The system according to claim 18 wherein there is provided a corner block comprising:

a body having a first rectangular portion and a second rectangular portion which are formed integrally with one another;

the first rectangular portion having upright side walls which are elongate in a longitudinal direction between ends of the first rectangular portion and dimensions between top and bottom sides and between the upright side walls which are substantially identical to the masonry blocks;

the second rectangular portion having upright side walls extending outward from the first rectangular portion in a lateral direction oriented perpendicularly to the longitudinal direction of the first rectangular portion and having dimensions between top and bottom sides and between the upright side walls which are substantially identical to the first rectangular portion;

one of the side walls of the second rectangular portion being flush with one end of the first rectangular portion; and

a difference between dimension of the corner block in the longitudinal direction thereof and dimension of the corner block in the lateral direction thereof corresponding to approximately half a total length of the masonry blocks in the longitudinal direction thereof.

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