MODULAR BUILDING SYSTEM

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ABSTRACT
A modular building system for configuring a building structure includes foundation units, a plurality of wall panels, a plurality of wall joints and a roof unit. The foundation units are retained by an anchoring member or ballast contained in the units. The foundation units and wall panels are detachably attached as the engaging members and the complementary engaging members engage to each other and create a space with a top opening. Adjacent wall panels are attached by a plurality of wall joints. The roof unit comprises roof panels and joints engage with one another and with wall panels for covering the top opening of the building structure.
Fig. 3
Fig. 12A
MODULAR BUILDING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS


FIELD OF THE DISCLOSURE

[0002] The present disclosure relates to modular buildings, and more particularly, to structural elements for use in construction of the modular buildings.

BACKGROUND OF THE DISCLOSURE

[0003] The building construction field is generally labor and cost intensive. Construction of a building requires involvement of a considerable amount of time. To reduce the factors such as labor, cost and time involvement in the construction of the building, prefabrication systems provide a potential solution. A typical prefabrication system involves prefabricated structures that are erected together to form a building structure.

[0004] Existing prefabrication systems fall into two major categories, namely, wood and aluminum frame prefabrication systems, and a concrete prefabrication system. The wood and aluminum frame prefabrication systems are limited to low density suburban housing, where ground conditions are stable and dry. The wood and aluminum frame prefabrication systems are not suitable for those areas where the ground conditions are erosive and/or wet. These prefabrication systems involve wood and aluminum frame structures and a foundation on which a building structure is formed (by erecting the wood and the aluminum frame structures thereon.) The wood and aluminum frame structures and the foundation are generally lightweight.

[0005] Where the ground conditions are erosive and wet, a lightweight foundation of such a building structure may not withstand such conditions, and the structure may collapse. A concrete prefabrication system may be more appropriate for these conditions as well as urban settings due to fire and structural safety requirements.

[0006] All of these prefabrication systems have not been exploited to a great extent. More specifically, such systems are exploited in commercial construction sectors of industry, but in the case of residential construction, their use is very limited. Most of the prefabrication systems include structural systems such as walls and floors, which do not accommodate particular architectural design needs of individual users. In addition to not being user or market oriented to any substantial degree, these prefabrication systems tend to be costly, require expensive erection and dismantling cost. Accordingly, such prefabrication systems are unsuitable for applications in both commercial and residential construction sectors.

[0007] Apart from the above, building structures made by such prefabricated structures suffer from several disadvantages, such as cracking due to inclement weather conditions, which result in leaks and other structural damages. Further, inadequate and ineffective insulation to noise, heat and cold is one of the major problems in such building structures. Also, existing designs of such building structures are generally of a temporary nature and may not be easily customized to adapt to varying size and layout requirements of different building locations.

[0008] Furthermore, the portability of such prefabricated structures can be another problem because of their weight, complexity of structure and the danger of rupture of the prefabricated structures while in transport. These structures are often required in areas where accommodation is needed in an emergency situation or on a temporary basis, such as in natural disasters area, refugee camps and military bases. Oftentimes, such prefabricated structures need to be rapidly transported and erected to provide emergency habitable structures within a required time. Such existing prefabricated structures may not be easily and quickly erected despite these situational demands and requirements.

SUMMARY OF THE DISCLOSURE

[0010] In view of the foregoing disadvantages inherent in the prior art, the general purpose of the present disclosure is to provide prefabricated building structures (hereinafter “building structures” or “buildings”) such as a modular building for configuring a building structure that is configured to include all advantages of the prior art, and to overcome the drawbacks inherent therein.

[0011] An object of the present disclosure is to provide a modular building system that may be utilized in providing residential, commercial and emergency accommodations, in areas such as coastal areas, suburban housing areas and urban areas. Further, the modular building system may be utilized and erected independent of the nature of the ground or terrain on which it is erected.

[0012] Another object of the present disclosure is to provide a modular building system that may be easily erected and dismantled, and may be customizable to meet changing requirements in size and needs of long-term or permanent applications of building, or location of the building.

[0013] Yet another object of the present disclosure is to provide a modular building system that may be able to withstand poor weather conditions and may provide insulation from noise, heat and cold.

[0014] Still another object of the present disclosure is to provide a modular building system that may be readily transportable.

[0015] To achieve the above objects, in an aspect of the present disclosure, a modular building system for configuring a building structure is provided. The modular building system comprises at least one foundation unit, a plurality of wall panels, a plurality of wall joints and a roof unit. The foundation unit has a plurality of engaging members. Further, each of
the plurality of wall joints has a plurality of complementary engaging members on a bottom portion thereof. The complementary engaging members enable the wall joints to be detachably attached to the foundation unit by engaging with the engaging members, which wall joints may also secure the plurality of wall panels to the structure, and particularly, to the foundation unit. More particularly, each of the plurality of wall joints extends vertically from a top surface of a foundation unit, and between at least two adjacent wall members of the plurality of wall members for configuring a detachable attachment therebetween. The attachment of the wall panels and the foundation unit configure a space therebetween above the foundation member with a top opening. More particularly, each of the plurality of wall joints extends vertically from a top surface of a foundation unit, and between at least two adjacent wall members of the plurality of wall members for configuring a detachable attachment therebetween. Further, roofing unit may be comprised of a plurality of roof panels, which panels may have engaging members on edges thereof for detachable engagement with complementary engaging members of a plurality of roofing joints, which roof joints can be disposed between two roof panels. The roof panels may be disposed with respect to one another to form a peak, which peak may be crowned or covered by a cap. The roof panels, when so connected and disposed, may provide for covering the top opening of a building to configure the building structure.

The foundation unit may further comprise at least one securement component for stabilizing and holding the foundation in a desired place and position. In an embodiment, the securement component may comprise an at least one aperture, through which an anchoring member, such as a stake or shaft, may be driven, such that the anchoring member may be situated beneath the surface on which the building is erected, in order to hold the foundation unit in a desired place or position. In another embodiment, at least one securement component may comprise a container, which container may be inserted into or integrated within a foundation unit and which container may receive ballast (such as sand, gravel, and the like) therein to retain the foundation unit in a desired place or position.

In an embodiment, foundation units may further comprise floor panels, which panels may be disposed on a top side of said units to form a surface on which a user may place items or may walk or sit thereon while in the interior of the building. Said floor panels may rest on shelves and may be flush with wall panels in the foundation units.

These together with the other aspects of the present disclosure, along with the various features of novelty that characterized the present disclosure, are pointed out with particularity in the claims annexed hereto and form a part of the present disclosure. For a better understanding of the present disclosure, its operating advantages, and the specified object attained by its uses, reference should be made to the accompanying drawings and descriptive matter in which there are illustrated exemplary embodiments of the present disclosure.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The advantages and features of the present disclosure will become better understood with reference to the following detailed description and claims taken in conjunction with the accompanying drawings, wherein like elements are identified with like symbols, and in which:

**0020** FIG. 1 illustrates an end view of a corner wall joint, wall panels, and wall joint extensions of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0021** FIG. 2 shows a disassembled view of a corner wall joint and wall joint extensions of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0022** FIG. 3 shows a wall joint of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0023** FIG. 4 shows an end view of a wall joint, wall panels, and wall joint extensions of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0024** FIG. 5 shows a wall panel of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0025** FIG. 6 shows an end view of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0026** FIG. 7 shows a sectional view of a foundation unit of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0027** FIG. 8 shows a sectional view of a roof unit of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0028** FIG. 9 shows a side view of a roof panel and wall panel of a modular building system in accordance with an exemplary embodiment of the present disclosure.

**0029** FIG. 10 shows the connection of roof joints and roof panels of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0030** FIG. 11 shows a roof joint tooth and roof joint stays of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0031** FIG. 12A shows a roof apex cup of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0032** FIG. 12B shows roof joints, roof joint teeth, and roof joint stays of a modular building system, in accordance with an exemplary embodiment of the present disclosure.

**0033** FIG. 13 shows a modular building structure of a modular building system in an assembled state, in accordance with an exemplary embodiment of the present disclosure.

**0034** Like reference numerals refer to like parts throughout the description of several views of the drawings.

**DETAILED DESCRIPTION OF THE DISCLOSURE**

For a thorough understanding of the present disclosure, reference is to be made to the following detailed description, including the appended claims, in connection with the above-described drawings. Although the present disclosure is described in connection with exemplary embodiments, the present disclosure is not intended to be limited to the specific forms set forth herein. It is understood that various omissions and substitutions of equivalents are contemplated as circumstances may suggest or render expedient, but these are intended to cover the application or implementation without departing from the spirit or scope of the claims of the present disclosure. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.
The term “first”, “second”, “top”, “bottom”, “inner”, “outer” and the like, herein do not denote any order, quantity or importance, but rather are used to distinguish one element from another, and the terms “a” and “an” herein do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item.

The present disclosure provides a modular building system for configuring a building structure 1000 for residential, commercial and emergency accommodation purposes. The modular building system comprises a plurality of modular structures, such as at least one foundation unit 100, a plurality of wall panels 200, a plurality of wall joints 300, and a roof unit 400 that are assembled together to configure the building structure that may be used as residential and commercial purpose in case of emergency as well as a permanent shelter. Further, the building structure 1000 may be disassembled back into the plurality of modular structures, and may be transported to required construction locations.

An exemplary embodiment of a wall joint 300 of the modular building system is shown in FIG. 1 and FIG. 2. In this embodiment a wall joint of the modular building system comprises a corner wall joint 301 for joining a plurality of wall panels, and for receiving at least one roof joint. The wall joint 301 comprises a substantially elongate quadrilateral shaft 305, the height of which shaft may be substantially the same as the height of the wall panel or panels that attach to the wall joint. On at least one side of the elongate shaft of the wall joint is a first channel 310 and a second channel 320. The first and second channels 310 and 320 are formed from cut-outs made in the exterior of the shaft. The channels may be of varying shapes, and in an embodiment, may be so formed to permit engagement and secured attachment of a wall panel, wall joint extension 330, or other component, such that the attached component may be securely fastened to the wall joint. FIG. 1 shows a corner wall joint 301, wall panels 200, and wall joint extensions 330 in an assembled state. It will be apparent that more than one side of the shaft may include such channels, and in each embodiment, the sides that include such channels may be sides that are perpendicular to one another, such that the wall joint and wall panels attached thereto will form a corner of the building. In another embodiment, where the channels 310 and 320 are disposed on sides of the shaft that are parallel to one another, the wall joint 300 and wall panels 200 that are attached thereto may form an extended wall section or face of the building, which embodiment will be described in further detail below.

In yet another embodiment, and for erecting other configurations of wall panels 200, various other wall joints 300, such as a triple wall joint, a quadruple wall joint, and the like may be used. As described above, and as shown in FIGS. 3 and 4, two wall panels 200 may be connected in a straight line using a wall joint 302 with channels disposed on opposite sides of the wall joint shaft 305. It will be apparent to one skilled in the art that a triple wall joint is capable of receiving three wall panels. Similarly, a quadruple wall joint is capable of receiving four wall panels. It will be apparent to one skilled in the art that a building structure of the present system may be assembled in a variety of configurations, through the use of the various wall joints, for example, to configure building structures with varying floor plans and layouts to meet a particular need or preference of a user.

In an embodiment, the shaft 305 of the wall joint 300 further comprises a first end 306 and a second end 307, with the first end 306 disposed proximate to the surface on which the building system is erected (when the building system is in a constructed state), and the second end 307 disposed distal to the surface in such a state. The second end may include an aperture 307a for receiving a roof joint, and more particularly, a flange of a roof joint. Proximate to the second end may be a plurality of apertures in the sides of the shaft 307b, which apertures may be perpendicular to the faces of the sides. Said apertures 307b may correspond to apertures in a roof panel or roof joint (to be described in further detail below), such that, when the roof panel or roof joint is attached to the second end 307 of the shaft 305 of the wall joint 302, a pin may be inserted through each of the apertures on the sides of the shaft and through a corresponding aperture on the roof panel or roof joint to further secure the roof panel or roof joint to the wall joint.

Referring further to FIG. 3 and FIG. 4 another view of a wall joint 300 is shown, in an embodiment where the channels are disposed on sides of the shaft that are parallel to one another, and the wall joint 300 and wall panels 200 that are attached thereto may form an extended wall section or face of the building. In this embodiment, the wall joint 302 further comprises flanges 322 extending in opposite directions away from each other and from the shaft 305 of said joint, which flanges 322, when the wall joint is in an installed configuration in a modular building, are disposed on the exterior of said building. In an embodiment, the shaft 305 of the wall joint further comprises a first end 306 and a second end 307, with the first end disposed proximate to the surface on which the building system is erected (when the building system is in a constructed state), and the second end disposed distal to the surface in such a state. The second end may include at least one aperture 307a for receiving a roof joint, and more particularly, a flange of a roof joint. Proximate to the second end may be a plurality of apertures 307b in the sides of the shaft. Said apertures 307b may correspond to apertures in a roof panel or roof joint (to be described in further detail below), such that, when the roof panel or roof joint is attached to the second end 307 of the shaft 305 of the wall joint 302, a pin may be inserted through each of the apertures 307b on the sides of the shaft 305 and through a corresponding aperture on the roof panel or roof joint to further secure the roof panel or roof joint to the wall joint.

Referring now to FIG. 5, a wall panel 200 is shown. In an embodiment, a wall panel of the modular building system comprises a substantially planar unit that is configured to form a barrier between the interior and exterior of a building. The wall panel 200 will be preferably in the form of a quadrilateral, with a first side 201 configured to be disposed adjacent to an area of a foundation unit to form a corner between the wall panel and the foundation unit within the building structure. A second side 202 of the wall panel may be disposed adjacent to a roof panel to form a corner between the wall panel and the roof panel within the building. The second side 202 of the wall panels may further comprise a channel 208 disposed in proximity to the second side 202 on a face of said panel, which channel 208 may be capable of receiving a portion of a roof panel, and more specifically, a roof coupling bar that protrudes from an interior side of a roof panel, for facilitating the attachment of the roof panel to the wall panel. Proximate to the second side of the wall panel may be a plurality of roof pin apertures 212 that configure hollow openings that run from a third side 203 to a fourth side 204 of the wall panel, which apertures 212 may receive pins (to be described further below) for fastening a roof panel to a wall panel.
At least one of the four sides of the wall panel may further include an insulating member attached thereto, which insulating member (not shown) may prevent air and/or water from entering the building at a point where a wall panel is disposed against a roof panel, a foundation member, or another wall panel, for example. The insulating member may be of a sponge, rubber, or other similar pliable material.

Referring now to FIG. 6, a top view a foundation unit 100 is shown, in accordance with an embodiment of the present disclosure. The foundation unit 100 comprises a base 110 and an at least one wall 120 extending upwardly therefrom at a periphery of the base of the unit. The at least one wall is such that it extends inwardly from the periphery of the base a limited distance such that at least a portion of the base remains exposed at an interior of the foundation unit 100.

In an embodiment, the base 110 of the foundation unit 100 may further comprise a plurality of apertures 115 disposed thereon, which apertures 115 are capable of receiving an anchoring member (not shown) for stabilizing and holding the foundation unit in a desired place and position. In an embodiment, an anchoring member, such as a stake or shaft, may be driven, such that the anchoring member may be situated beneath the surface on which the building is erected, in order to hold the foundation unit in a desired place or position. The anchoring member may be made of materials including, but not limited to, high density polyethylene (HDPE). In an embodiment of the present disclosure, the anchoring member includes a head area and a tail area. The head area may be substantially thicker than the tail area, and may include a tapping cap at a top portion thereof. The anchoring member may be inserted into an aperture by using a mallet (not shown) or a pin awl (not shown) until an at least a portion of the tail area is inserted into the ground.

In another embodiment, the base 110 of the foundation unit further comprises a cavity that is formed by the disposition of walls 120 extending upwardly from each side of the foundation unit 100. In such an embodiment, a user may place a container (not shown) in said cavity, which container may be filled with ballast material such as gravel, sand, water (held within in a bladder, for example), and the like, and which container may secure the building system to the ground or surface on which the building system is erected, to provide stabilization to the system in its erected state.

Referring now to FIG. 7, a partial view of the at least one wall 122 of the walls 120 of the foundation unit 100 is shown. The wall 122 may be of sufficient width, when measured from the exterior side of the foundation unit 100, to include a channel 130 therein, as well as a shelf 140 formed at the edge of the wall that is distal to the exterior side of the foundation unit 100. The channel 130 so formed may be of an appropriate width and depth to securely receive at least one of a side of a wall panel 200 and at least one wall joint extension 330, and the channel 130 may include an indentation 132 therein to receive further the insulating member disposed on a side of the wall panel 200. Extending further inward from the exterior side of the foundation unit 100, the wall 120 of the foundation unit 100 may include a shelf 140 that is formed from a section that is cut out of the wall. More specifically, the shelf 140 may be disposed at the termination of the wall 120 that is proximate to the interior of the foundation unit 100. The shelf 140 may include a substantially planar region 142 that extends away from and beneath the top side of the at least one wall 120 of the foundation unit 100. The shelf 140 may support a floor section (to be described in greater detail below) that may be disposed above the base 110 of the foundation unit 100. It will be apparent that the removable attachment of a floor section allows a user to first secure the foundation unit 100 with an anchoring member or ballast container as described above before placing the floor section on the foundation unit 100.

Referring still to FIG. 7, the foundation unit 100 further comprises at least one foundation pin aperture 128, which aperture 128 extends along the full dimension of the foundation unit 100 in a linear direction, which at least one aperture 128 is capable of receiving a foundation pin, which pin may extend at least along the full length of the aperture 128. Further, a first foundation unit 100 may be disposed adjacent to a second foundation unit 100 such that the at least one foundation pin aperture 128 of the first foundation unit 100 may be disposed in sufficient proximity to the at least one foundation pin aperture 128 of the second foundation unit 100, such that a foundation pin of an appropriate length may be inserted into and span through the corresponding foundation pin apertures 128 of the two foundation units, in order to facilitate secure attachment and retention of the two foundation units 100 adjacent to one another.

Referring again to FIG. 6, the foundation unit 100 may further comprise at least one aperture 127 for receiving a wall joint 300 therein, which at least one aperture 127 may be disposed on a top side of the at least one wall 120 of the foundation unit 100 at a position that facilitates corresponding engagement with a wall joint 300. Referring to FIGS. 2 and 3 again, a wall joint 300 of the present disclosure further comprises at least one foundation tooth 350 at a first end 306 end of said wall joint 300, which tooth 350 may be received in a wall joint aperture 125 or 127 of a foundation unit 100. The foundation tooth 350 of a wall joint 300 of the present disclosure comprises a protuberance that extends away from the wall joint 300, the dimensions of which protuberance correspond to the dimensions of a wall joint aperture 125 or 127 of a foundation unit 100 such that the insertion of the foundation tooth 350 into the wall joint aperture 125 or 127 results in a substantially secure fit of the wall joint 300 to the foundation unit 100. The tooth 350 may further comprise at least one aperture thereethrough that is capable of receiving a holding pin for retaining the wall joint 350 within the wall joint aperture 125 or 127.

Referring again to FIG. 6, in an embodiment, a modular building 1000 of the modular building system may be formed by disposing four quadrilateral-shaped foundation units 100 against one another, with one corner of each unit 100 abutting one corner of each other unit 100 at a single point. In such an orientation, the walls 120 of the foundation units 100 may be so disposed that a wall joint aperture 125 is disposed at each corner of the aggregate foundation formed by the four foundation units 100. Further, in such an orientation, adjacent foundation units 100 may combine to form a wall joint aperture 127 at each midpoint of a side of the aggregate foundation formed by four foundation units. In an embodiment, the walls 120 of the foundation units 100 that are adjacent to one another may include corresponding foundation wall apertures 118 therein through which pins or screws may be inserted to facilitate secure attachment of each of the foundation units 100 to one another. In an embodiment, a holding pin inserted through said apertures 118 of a plurality of foundation units will be of sufficient length to extend through the plurality of foundation units for providing secure attachment of said foundation units.
In an embodiment, a floor section (not shown) of a foundation unit 100 of the present disclosure comprises a substantially planar component of dimensions that permits secure attachment and placement of a floor section upon a foundation unit 100. Furthermore, said floor section may have a first side and a second side such that, when the floor section is placed upon a foundation unit 100, said first side is distal to the base 110 of the foundation unit 100 and said second side is proximate to the base 110 of the foundation unit 100. Said second side of said floor panel may include complementary configurational features, such as cut outs, for example, along the periphery of said floor panel, that facilitate secure engagement with a foundation unit 100, and particularly, the shelf 140 of the walls 120 of a foundation unit 100.

[0051] Referring now to FIG. 8 and FIG. 9, a partial view of a roof unit 400 of a modular building system is shown, in an exemplary embodiment of the present disclosure. The roof unit 400 of the building system includes at least one roof panel 410, to be discussed in further detail below. The roof panel 410 of the building system may optionally extend past the perimeter of the building structure or wall panels, for example, for providing overhead shelter beyond the wall panels of the building structure. On the underside of the roof panel 410 is a roof coupling bar 414, which roof coupling bar 414 permits a roof panel 410 to attach to a wall panel 200. The roof coupling bar 414 is disposed substantially parallel to a side or edge of the roof panel 410 to which it is attached, and the bar may run along the entire length of the side or edge of the panel 410 on which it is disposed. The roof coupling bar 414 is so configured to permit removable secure attachment with a wall panel 200, and more particularly, with a channel 208 of a side 202 of a wall panel 200. In an embodiment, the roof coupling bar comprises a pair of prongs that extend over the edge of a side 202 of a wall panel 200 sufficiently far enough to engage, on each face of a wall panel 200, the channel 208 that is disposed away from the side 202 of the wall panel 200. The wall panel 200 includes a plurality of roof pin apertures 416, which apertures 416 may receive roof holding pins, which pins may be of sufficient length to extend through a wall panel 200 and roof tooth (discussed in detail below) for securing a roof panel 410 to a modular building.

[0052] Referring again to FIG. 8, a sectional view of a roof unit 400 of a modular building system is shown. In an embodiment, the roof unit 400 of a modular building system comprises a plurality of roof panels 410, a roof apex cap 420, and a plurality of roof joints 430. Roof panels 410 are substantially planar triangular units with engagement members on the edges thereof. In an embodiment, roof panels 410 may be in the form of isosceles right triangles. To form a roof unit 400 of a modular building system, a pair of roof panels 410 may be disposed adjacent to one another such that the hypotenuse of each panel 410 of the pair of panels 410 is disposed against the other. In such a configuration, a quadrilateral is formed. The roof unit 400 of a modular building system may accordingly comprise a plurality of quadrilaterals so formed, to form a roof unit 400 of an appropriate size and dimensions to provide for cover of an interior of a modular building structure.

[0053] Roof joints 430 comprise substantially flat and elongate members with engagement features along the sides thereof. Said engagement features permit attachment with complementary engagement features of roof panels 410. In an embodiment, a roof joint 430 may be disposed between the hypotenuse of a first roof panel 410 and the hypotenuse of a second roof panel 410 to secure such roof panels together. Further, a roof joint 430 may be disposed between a leg of a first roof panel 410 and a third roof panel 410 to secure such roof panels together. The engagement features of a roof joint 430 and roof panel 410 of the present disclosure will be explained in detail below, in conjunction with FIGS. 10 and 11. In an embodiment where the plurality of quadrilaterals are so formed as to create a pitched or sloped roof unit 400 that culminates in a central high point, the plurality of quadrilaterals formed by a pair of roof panels 410 may further be secured together at said central point. A roof apex cap 420 may secure the plurality of quadrilaterals so formed by covering the common point at which the plurality of quadrilaterals are proximately disposed. It will be apparent that the apex cap 420 may be appropriately configured to accommodate a slope of the roof unit 400 of a modular building while still maintaining a secure attachment to the roof panels 410 and/or roof joints 430 thereof. When said roof apex cap 420, roof joints 430, and roof panels 410 are in an assembled state, a roof unit 400 is configured to provide cover over the interior of the modular building.

[0054] Referring now to FIG. 10, detailed views of exemplary engagement features of roof joints 430 and roof panels 410 are shown, in accordance with exemplary embodiments of the present invention. In an embodiment, a roof panel 410 will include a tooth 411, which tooth 411 may engage with a groove 431 of a roof joint 430, for secure attachment of the roof panel 410 and the roof joint 430. The groove or grooves of a center roof joint 430a may be oriented such that the center roof joint 430a attaches to a first and a second roof panel 410 to form and maintain a substantially planar construction. The groove or grooves of a corner roof joint 430b may be oriented such that, when a first and third roof panel 410 are attached to said corner roof joint 430b, an appropriate transition between the first and third roof panel 410 is achieved to maintain engagement (not shown) between the first roof panel 410 and its corresponding wall panel and between the third roof panel and its corresponding wall panel. Such a corner roof joint 430b may be utilized to secure roof panels that are attached to wall panels that form a corner of a modular building.

[0055] FIG. 11 shows detailed views of a roof joint tooth 435 and of a roof joint stay 436 of a roof joint 430, in accordance with an embodiment of the present disclosure. A roof joint 430 comprises at least one roof joint tooth 435 and at least one roof joint stay 436. A roof joint tooth 435 of a roof joint of the present disclosure comprises a square-shaped flange that extends away from the underside of a roof joint at a point on the roof joint that is distal to the roof apex of the building system. The at least one roof joint stay 436 further comprises at least one aperture 438 extending completely therethrough, which at least one aperture may accept a holding pin for obtaining secure attachment of the roof joint to the building structure. The roof joint 430 may further comprise at least one roof joint stay 436, which stay comprises a protrusion that extends away from the underside of a roof joint 430. In a preferred embodiment, a roof joint 430 will comprise two joint stays 436a and 436b, with one stay 436a disposed on one side of the at least one roof joint tooth 435 along the underside of the roof joint 430, and the other stay 436b disposed on the other side of the at least one roof joint tooth 435 along the underside of the roof joint 430 such that the at least one roof joint tooth 435 may be inserted into an aperture 307a on a second end 307 of a wall joint 300, which insertion
will provide secure attachment of the at least one roof joint tooth 435 of the roof joint 430 to a wall joint 300. Further, the joint stays 436 will be positioned accordingly with respect to the at least one roof joint tooth 435 and dimensions of the wall joint 300 such that the joint stays will be securely disposed against the exterior of the second end 307 of the wall joint 300.

[0056] Referring now to FIG. 12A, a view of a roof apex cap 420 is shown. In an embodiment, the apex cap 420 comprises a neck portion 422 immediately underneath the cap, and a flange portion 424 underneath the neck portion. The neck portion 422 may accommodate the ends of roof panels 410 and/or roof joints 430, with the apex cap 420 and flange portion being disposed over at least a portion of the roof joints 430 and/or roof panels 410, such that a weatherproof seal is created by the roof apex cap 420 between the side of the roof panels 410 and roof joints 430 that is exposed to the exterior of the modular building and the side roof panels 410 and roof joints 430 that is exposed to the interior of the modular building.

[0057] Referring to FIG. 12B, overhead perspective views of roof joint teeth 435 and roof joint stays 436 are shown, for a center roof joint 430a and for a corner roof joint 430b. It will be apparent that the at least one roof joint tooth 435 and the at least one roof joint stay 436 of a roof joint 430 may be appropriately positioned so that the corresponding at least one wall joint aperture 307a may securely receive the at least one roof joint tooth 435 and so that the at least one roof joint stay 436 may securely bracket the wall joint 300 against which it is disposed.

[0058] Shown in FIG. 13 is a modular building 1000 of a modular building system in an assembled state. It will be apparent to one skilled in the art that the wall panels 200 will be formed from materials that permit a user to make requisite cut-outs for windows, doors, and the like, and that such cut-outs may accept such windows, doors, and the like by way of hinges, seals, frames, and other securing mechanisms known in the art. In an embodiment, wall panels 200 may comprise a plurality of thin layers of polypropylene, with a polypropylene honeycomb or lattice formation between each layer.

[0059] Further regarding the resiliency of the materials used to construct the components of the modular buildings 1000 of the modular building system herein, a user may make requisite cuts or adjustments to permit the connection of plumbing, electrical, or HVAC systems from an exterior source and to permit installation of requisite interconnections of such components of such systems within a building to provide for service of such systems throughout a modular building.

[0060] The building or building structure 1000 constructed by the modular building system may be easily dismantled by removing foundation unit and roof unit holding pins and anchoring members used in assembling of the building. The disassembled parts such as the foundation units, the wall panels, the wall joints and the roof joints and panels and other parts may be easily transported from one place to another place. Further, based on the particular need, the size of the building and the number of rooms in the building may be customized based on using the various components. The building constructed by the modular building system may be used on a short-, long-term, or a semi-permanent basis.

[0061] The modular building system of the present disclosure is advantageous in constructing buildings for both residential and commercial purposes in suburban housing areas, urban buildings areas and disaster areas. The modular building system may also be utilized to construct a building structure in wet or icy ground conditions. Further, the modular building system may be easily erected and dismantled.

[0062] Furthermore, the modular building system is capable of providing insulation against noise, heat and cold, and is capable of withstanding in inclement weather conditions. Moreover, the modular building system is easily and readily transportable.

[0063] The foregoing descriptions of specific embodiments of the present disclosure have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the present disclosure to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the present disclosure and its practical application, to thereby enable others skilled in the art to best utilize the present disclosure and various embodiments with various modifications as are suited to the particular use contemplated. It is understood that various omission and substitutions of equivalents are contemplated as circumstance may suggest or render expedient, but such are intended to cover the application or implementation without departing from the spirit or scope of the claims of the present disclosure.

What is claimed is:
1. A modular building system for configuring a building structure, the modular building system comprising:
   - at least one foundation unit,
   - said foundation unit comprising a base and an at least one wall extending upwardly from said base at a periphery of the base of said unit, said wall including a channel and a shelf therein, and
   - said foundation unit further comprising at least one aperture disposed on a top side of the at least one wall thereof;
   - a plurality of wall panels each of the plurality of wall panels having engagement features thereon, which engagement features permit removable attachment of each wall panel of the plurality of panels to a channel of a foundation unit of at least one foundation unit, and which engagement features further permit removable attachment of each wall panel of the plurality of panels to a wall joint of the modular building system;
   - a plurality of wall joints, said wall joints comprising engagement features thereon, which engagement features permit removable attachment to at least one foundation unit, at least one panel, and a roof unit; and
   - a roof unit,
   - said roof unit comprising a plurality of roof panels and a plurality of roof joints, wherein said roof joints attach to said roof panels and connect the roof panels of the plurality of roof panels to one another,
   - said plurality of roof panels further comprising engagement features, which engagement features facilitate attachment of said panels to said wall panels of a modular building system, and
   - said plurality of roof joints further comprising engagement features, which engagement features facilitate attachment of said joints to at least one wall joint of a modular building system.

2. The modular building system of claim 1, the system further comprising at least one floor panel, said floor panel
comprising a substantially planar unit with a first face and a second face with engagement features disposed on the second face thereof that permit secure attachment of said floor panel to a shelf of a foundation unit of the modular building system.

3. The foundation unit of claim 1, wherein the base of said foundation unit further comprises at least one aperture thereon, which at least one aperture may accept an anchoring member therethrough, for securing the foundation unit to a surface.

4. The foundation unit of claim 3, wherein said anchoring member comprises one of an elongate stake and an elongate shaft.

5. The foundation unit of claim 1, wherein said unit comprises a plurality of walls extending upwardly from the base of said unit, which plurality of walls form a cavity within said unit, and within which cavity a container of ballast may be placed.

6. The plurality of wall panels of claim 1, each of which wall panel of the plurality of wall panels further comprises at least one channel disposed on a face thereof, and which panels may further comprise a plurality of apertures that are disposed through said panel substantially parallel and adjacent to said channel, and at least one insulating member disposed on at least one side of each panel of the plurality of panels.

7. The plurality of wall joints of claim 1, wherein the engagement features of the at least one wall joint of the plurality of wall joints comprises an elongate quadrilateral shaft with a first end and a second end, and a first channel and a second channel disposed on the exterior of said shaft, an aperture at the first end of said shaft, and a foundation tooth at the second end of said shaft,

wherein said first channel is configured to receive and securely retain a side of a wall panel, and
wherein said second channel is configured to receive and securely retain a wall joint extension;
wherein said aperture is configured to receive and securely retain engagement features of at least one roof joint; and
wherein said foundation tooth is configured to be received in and securely retained by an aperture disposed on a top side of a foundation unit.

8. The roof unit of claim 1, wherein each roof panel of said plurality of roof panels comprises a substantially planar triangular unit, and wherein the engagement features of said panels comprise a tooth disposed along each side of the triangle of the triangular unit, and

wherein each roof joint of the plurality of roof joints comprises a substantially flat elongate member that has as a length dimension that corresponds to a length dimension of the side of the roof panel to which a roof joint is attached, and each roof joint comprises a groove as an engagement feature for secure attachment to the tooth of a roof panel; and

wherein said roof unit further comprises a roof apex cap that may receive a portion of each roof joint of the plurality of roof joints and a portion of each roof panel of the plurality of roof panels for securing said joints and panels at a central point.

9. The roof panel of claim 8, said roof panel further comprising a bar that is disposed on an underside of said panel along a side of said panel that is proximate to a wall panel of a modular building, which bar comprises a pair of prongs that extend over a side of a wall panel onto the at least one channel of a wall panel for removable attachment of a roof panel to a wall panel.

10. The roof joint of claim 8, wherein said joint further comprises at least one roof joint tooth and at least one roof joint stay,

wherein said roof joint tooth comprises a square-shaped flange that extends away from an underside of a roof joint at location on said roof joint that corresponds to a wall joint against which a roof joint may be disposed, and wherein said roof joint tooth may be received in an aperture of a first end of a wall joint,

wherein said roof joint tooth further comprises at least one aperture therein, which at least one aperture may receive a pin therethrough for further securing the tooth and roof joint within a wall joint or to the building structure;

wherein said at least one roof joint stay comprises a protrusion that extends away from an underside of said roof joint, which at least one roof joint stay may be so position on said underside that, when a roof joint is position in proximity to a wall joint, the at least one roof joint stay is immediately adjacent to and conforms to the exterior of a shaft of a wall joint to which the roof joint is proximate.

11. The modular building system of claim 1, the system further comprising at least one wall joint extension, said wall joint extension comprising a substantially elongate unit, which unit may be received in a foundation unit in proximity to a wall joint that is also received in a foundation unit, and which wall joint may be adjacent to a wall panel and may extend along a dimension of said wall panel for providing support to the wall panel of a building structure.

12. The foundation unit of claim 5, wherein said walls of said foundation unit comprise a plurality of apertures extending perpendicularly through said walls, which apertures may, when a plurality of foundation units are disposed against one another, receive pins that may extend from the plurality of apertures of one foundation unit into the plurality of apertures of another foundation unit for securely retaining each of the foundation units in a desired position or configuration.

13. The foundation unit of claim 1, wherein said walls of said foundation unit comprise a plurality of apertures extending parallelly through said walls, which apertures may, when a plurality of foundation units are disposed against one another, receive pins that may extend from the plurality of apertures of one foundation unit into the plurality of apertures of another foundation unit for securely retaining each of the foundation units in a desired position or configuration.

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