A prefabricated integrated utilities building core including a floor diaphragm, four walls connected to the floor diaphragm, and a utilities access corridor, and a method of constructing a building using the same are disclosed herein. The floor diaphragm and the four walls form an interior of the prefabricated integrated utilities building core. The utilities access corridor has at least one access wall with a passage configured to provide access to and from the utilities access corridor from the interior of the prefabricated integrated utilities building core. There are a plurality of integrated utilities arranged within the prefabricated integrated utilities building core so as to be fully accessible from within the utilities access corridor. The utilities access corridor also includes an in-floor access hatch arranged to provide access to an in-floor portion of at least the plumbing of the plurality of integrated utilities.
FIG. 2
FIG. 5
600

Place integrated utilities core [601]

Attach to pre-existing infrastructure [602]

Erect building envelope [603]

Jack core and build below [604]
PREFABRICATED INTEGRATED UTILITIES BUILDING CORE SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/433,190, titled "PREFABRICATED UTILITIES INTEGRAL BUILDING CORE SYSTEM," and filed on Jan. 14, 2011, which is hereby incorporated by reference in its entirety.

BACKGROUND

[0002] The present application relates generally to the field of buildings and more specifically to building structures with prefabricated components, and prefabricated buildings that are configured to be re-purposable.

[0003] Traditionally, prefabricated buildings consist of multiple modules, such as prefabricated floors, walls, and roofs that are manufactured off-site and subsequently transported to the building site to be assembled into finished form. In some cases, the building may be assembled in its entirety off-site and transported to the building site.

[0004] Transporting a prefabricated building in its finished state presents certain challenges. Notably, a completely prefabricated building consists of significant amounts of empty open space, and therefore presents logistical and transport inefficiencies. On the other hand, a prefabricated building consisting of modules that are assembled on-site is transported as a set of discrete modules that may be more easily and efficiently transported to the building site.

[0005] While construction of a modular prefabricated building is faster than traditional on-site building construction methods, the builders assembling a prefabricated building must nevertheless run plumbing, electricity, and HVAC lines, among other things, throughout the building. This can slow the construction process significantly.

[0006] Also of note, humanitarian aid and disaster response personnel often need access to rapidly deployable and re-purposable housing structures. Such structures can be bulky to transport and are not well adapted to the changing climatic and cultural needs of a given locality.

SUMMARY

[0007] There is a need for a prefabricated building solution that provides rapid deployment and assembly, ease of transport, adaptability, re-purposability, and that provides the ability to adapt to any number of climatic and cultural settings.

[0008] In one embodiment, a prefabricated integrated utilities building core includes a floor diaphragm, four walls connected to the floor diaphragm, and a utilities access corridor. The floor diaphragm and the four walls form an interior of the prefabricated integrated utilities building core. The utilities access corridor has at least one access wall with a passage configured to provide access to and from the utilities access corridor from the interior of the prefabricated integrated utilities building core. There are a plurality of integrated utilities arranged within the prefabricated integrated utilities building core so as to be fully accessible from within the utilities access corridor. The plurality of utilities includes (a) plumbing, (b) electrical, and (c) HVAC. The utilities access corridor also includes an in-floor access hatch arranged to provide access to an in-floor portion of at least the plumbing of the plurality of integrated utilities.

[0009] In one embodiment, a method of constructing a building that includes a prefabricated integrated utilities building core, and wherein the prefabricated integrated utilities building core comprises a floor diaphragm connected to four walls, a utilities access corridor comprising an interior passage, and a plurality of integrated utilities comprising plumbing, electrical, and HVAC, the method comprises placing a prefabricated integrated utilities building core at a predetermined position on a site. Another method step includes attaching the plumbing of the plurality of integrated utilities to preexisting infrastructure at the site through an in-floor access hatch in the floor diaphragm of the utilities access corridor. Yet another method step includes erecting an exterior envelope around the predetermined site position of the prefabricated integrated utilities building core.

[0010] In one embodiment, a re-purposable building structure includes a prefabricated integrated utilities building core and an exterior envelope. The prefabricated integrated utilities building core includes a floor diaphragm, four walls connected to the floor diaphragm, and a utilities access corridor. The floor diaphragm and the four walls form an interior of the prefabricated integrated utilities building core. The utilities access corridor has at least one access wall with a passage configured to provide access to and from the utilities access corridor from the interior of the prefabricated integrated utilities building core. There are a plurality of integrated utilities arranged within the prefabricated integrated utilities building core so as to be fully accessible from within the utilities access corridor. The plurality of utilities includes (a) plumbing, (b) electrical, and (c) HVAC. The utilities access corridor also includes an in-floor access hatch arranged to provide access to an in-floor portion of at least the plumbing of the plurality of integrated utilities. The exterior envelope encloses the prefabricated integrated utilities building core.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 shows a perspective view of one embodiment of a building comprising a prefabricated integrated utilities building core.

[0012] FIG. 2 shows a plan view of one example of a prefabricated integrated utilities building core.

[0013] FIG. 3 shows a perspective view of an example a prefabricated integrated utilities building core.

[0014] FIG. 4 shows another perspective view of an example a prefabricated integrated utilities building core.

[0015] FIG. 5 shows yet another perspective view of an example of a prefabricated integrated utilities building core.

[0016] FIG. 6 is a flow chart representing a method embodiment for constructing a prefabricated building comprising a prefabricated integrated utilities building core.

[0017] Like reference numbers and designations in the various drawings indicate like elements.

DETAILED DESCRIPTION

[0018] In the following detailed description, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that various changes may be made without departing from the
The following detailed description is, therefore, not to be taken in a limiting sense. Fig. 1 shows a perspective view of a building comprising a building envelope 100, comprising a core 105. Typically, building envelope 100 comprises a plurality of exterior walls 101 and a roof 102. However, in some embodiments building envelope 100 may be a monolithic structure, such as a monolithic domed building, that does not have exterior walls, i.e., the domed "roof" also functions as exterior walls.

In some embodiments, core 105 may comprise all of the utilities for the building envelope 100. For instance, core 105 may comprise all of the plumbing necessary to support water use and consumption, including plumbing and/or electricity for waste and supply stubs 140 for a kitchen or lavatory sink, and washer and dryer set 128. The core 105 may also include a passage 124, such as a door, for access to the interior of the core 105.

As may be readily understood by those of ordinary skill in the art, a core 105 configured to comprise all of the utilities for a building envelope 100, including water, electricity, and HVAC, promotes the rapid assembly of the building envelope 100. Additionally, core 105 may be configured to be installed in virtually any environment and climate, and as such, provides a robust and adaptable solution that may be used in a variety of situations including, but not limited to, disaster response, humanitarian aid, and many other situations in which rapid deployment of numerous housing units may be desirable.

When in place, core 105 may provide the utilities, including the plumbing, electricity, and HVAC, for a building envelope 100. In one embodiment, the building envelope 100 may be constructed such that all rooms requiring access to plumbing are situated in immediate proximity to core 105. For instance, in one example, a kitchen might be constructed along wall 144 of the core 105 comprising plumbing waste and supply stubs 140. In another embodiment, building envelope 100 may comprise a plurality of cores 105 to provide additional lavatories, among other things.

It is to be understood that the core 105 may be placed before, after, or concurrently with the building envelope 100. For instance, the floor of the building envelope 100 may be placed as core 105 is being attached to the utility lines of a building site. Alternatively, building envelope 100 can be constructed and core 105 placed upon completion of building envelope 100. As another alternative, core 105 can be placed initially and building envelope 100 assembled once the core 105 is in place.

The nature of the core 105 as a utilities module enables the core to be used as a disaster response module, with the use of temporary foundations and addition of attachments such as fabric-covered shelters that may function as the building envelope 100. In some embodiments, the core 105 may be adapted to a variety of building envelopes 100 such as, for instance, indigenous materials and indigenous building methods for those living in areas affected by a natural disaster and thus facilitating the conversion of a temporary structure into long-term sustainable housing and communities. Thereby, it may be possible to avoid material waste, while effectively and efficiently addressing sanitation and rebuilding needs. In some embodiments, the core 105 can be combined with a rainwater collection pan to capture rainwater to be used to flush waste out of the core 105 and into temporary sewage bags or cisterns, as a response to the sanitation concerns associated with disaster and humanitarian aid response. In some embodiments, potable water may be captured with the rainwater collection pan, preferably by inclusion of a filtration system, such as, for instance, a filtration assembly comprising a floatation valve and/or flap valve assembly with a sediment trap.

The core 105 and the building envelope 100 may comprise any suitable type of material. For instance, the walls of the building envelope 100 and the core 105 may comprise standard framing and sheetrock, steel beams, structural insulated panels, or any other form of suitable materials. Furthermore, because the core 105 is designed and configured to be used in a variety of climates and conditions, the construction of a building envelope 100 comprising any number of materials indigenous to the area of a disaster or humanitarian aid response is contemplated. Additionally, the core 105 may be configured to facilitate stacking cores in order to provide a multi-story prefabricated construction in order to house as many persons as possible in a small space.

In one embodiment, plumbing features may include grey-waste pipes (e.g., grey waste plumbing 204 in Fig. 2) located near a wall (e.g., wall 250 in Fig. 2) of the core 105 for re-using both and shower waste, manifold systems (e.g., hot/cold water supply manifold 238 and solar inverter panel 242 in Fig. 2) for hydronic and water supply that include valves and that thereby eliminate the need for individual valves at appliances, room designed for vertical chases (e.g., mechanical chase/plenum 358 in Fig. 3) for stacking the cores 105 using multi-story building methods, and floor or wall hatches and panels (e.g., in-floor hatch 202 in Fig. 2 and removable wall panel 362 in Fig. 3) that allow access to plumbing components without the destruction of interior walls or ceilings in order to access or repair plumbing. The accessibility of the runs and controllers for utilities and electrical systems of the core 105 may decrease long-term maintenance costs. The core 105 may be configured with hydronic controls (e.g., HVAC unit 252 in Fig. 2, which may comprise a hydronic boiler, pumps, and controls in some embodiments included, and hydronic heat systems including manifolds that allow for hydronic tubing with fluid heat transfer to the building. Hydronic systems may be configured to decrease cost related to HVAC systems in the long term by using the efficiencies of low heat high mass heating. Such systems may also allow for the efficient use of solar heat gain through passive solar systems, and the distribution thereof, through a hydronics system. In some embodiments, a thermal heat storage system, such as a thermal battery, may be placed under the core 105.

The core 105 may be sheathed with Oriented Strand Board (OSB) with high resin content for its moisture resistant properties or magnesium oxide board, and internally finished with typical sheetrock while leaving access panels for plumbing access. In some embodiments, the core 105 may be configured to provide an exterior wall for the building envelope 100. In such embodiments, the exterior wall (see, e.g., wall 250 in Fig. 2, which may be configured to be an exterior wall in some embodiments) of the core 105 may also be insulated with EPS spray foam, or may be constructed of Structural Insulated Panels. In some embodiments, the ceiling diaphragm 154 of the core 105 may also be sheathed with high-resin-content OSB or magnesium oxide board.
The fixtures within the core 105, such as the water heater 236, sink 220, toilet 216, tub or shower pan 208, may be attached in a finished state. As used herein, “attached in a finished state” means attaching to core 105 so as to be “turn-key ready,” or ready for use upon installation of the core 105. Shipping all utility runs, fixtures, and appliances in a fully assembled state within the core 105 may add efficiency to the on-site building process. For instance, on-site utility and fixture installation labor, which may be expensive and/or unskilled in some areas, may be all but eliminated.

Fig. 2 shows a plan view of one embodiment of a core 205 comprising at least two sub-parts: (1) a bathroom subpart comprising a shower pan or bathtub 208, a toilet 216, and a sink 220, and (2) an access corridor comprising an in-floor hatch 202, an HVAC unit 252 (or a hydronic boiler including pumps and controls in some embodiments), a natural gas or LP manifold 246, a solar inverter panel 242 (or an electrical power supply panel and breakers in some embodiments), a hot/cold water supply manifold 238, and a water heater 236. In some embodiments, the plurality of utilities for the building envelope 100 may be contained almost entirely within the access corridor of the core 205 to facilitate access, repair, and inspection thereof. Core 205 may comprise one or more passages 224, 222, and 212, which may comprise doors. The core 205 may comprise grey waste and black waste plumbing 204 and 206, respectively. A washer and dryer set 228 may be installed and arranged within a specially designed washer/dryer insert of the core 205 and may be connected to the utilities thereof via a wall box 230 comprising plumbing waste and supply connections.

When in use, core 205 may be configured such that grey waste water exits through grey waste plumbing 204 contained in the utilities access corridor, black waste water exits through black waste plumbing 206 contained in the utilities access corridor, and the water of the core 205 supply enters through a water supply pipe 478 (see FIG. 4). In one embodiment, the water supply passes through hot/cold water supply manifold 238 and water heater 236, and is distributed to the appropriate fixtures via, for instance, lavatory sink supply pipe 218, shower head valve assembly 210, and/or waste and supply stubs 240 for the kitchen sink, among other things. In one embodiment, core 205 is configured to make use of grey water such that, for instance, grey water from the sinks may be recycled and used in a toilet 216 via toilet supply 214. In one embodiment, the plumbing runs may be exposed and run on the floor and walls of the core 205, as opposed to within the floor or walls, and thus may provide ready access to the plumbing for inspection, maintenance, and repair, among other things. Additionally, in-floor hatch 202 may provide access under the floor (in the crawl space, where required by code) to plumbing hook ups in order to facilitate rapid setup and easy access for maintenance and upkeep. Furthermore, such ready access to the plumbing supply lends itself unhooking and re-using the building comprising building envelope 100 and core 205 in disaster and/or humanitarian aid situations where there may be an interest in the ability to setup a temporary building, and later move and re-use the same building in a different locale.

In some embodiments, core 205 is delivered on-site with pre-installed connections, fixtures, and appliances, such as a washer and dryer set 228. Additionally, core 205 may be delivered on-site with rough plumbing, supply, drains, and vents. In some embodiments, core 205 may comprise a HVAC unit 252 comprising conventional water heaters and boilers, or, in some cases, may comprise hydronic heating boilers, controls, and pumps, all complete with plumbing manifolds and valve assemblies. In other embodiments, core 205 comprises natural gas and liquid propane manifolds 246 including valves and connections.

In one embodiment, core 205 may comprise water re-use systems such as, for example, grey waste reclamation systems. In this embodiment, grey waste drains and plumbing runs may be separated from black waste drains and configured to recycle grey waste water, as appropriate, throughout plumbing of building envelope 100. Core 205 may also comprise other alternative waste apparatuses such as, for example, composting or incinerating toilets, water storage tanks or bladders, water filtration units, and as necessary, water pressurization and equalization equipment.

Core 205 may be configured to employ any number of HVAC systems and controls. For instance, HVAC unit 252 may comprise a hydronic boiler or a more conventional furnace, among other things. In some embodiments, core 205 may be delivered with thermostats, air exchangers, fans, vents, and ductwork pre-installed. Core 205 may also be delivered with fully installed and functional systems including one or more of: forced air systems, air conditioning coil/heat exchange units, hydronic boilers, solar hydronic controls and equipment, air purification and filtration components, heat pump controls, and mini-split connections and components.

When in use, HVAC unit 252 may comprise a hydronic boiler and may be configured to cycle heated fluid throughout the core 205 and/or the building envelope 100. In one embodiment, the heated fluid travels out of the hydronic boiler and through coils running in the building envelope 100. The access corridor may also be designed to promote the circulation of air for heating and/or cooling. For instance, in one embodiment, access corridor may receive air through air return 470 (see FIG. 4) which may promote air circulation, over washer/dryer sets 428, through air return 470, and then on to HVAC unit 252. In another embodiment, HVAC unit 252 is a natural gas furnace, including natural gas or LP manifold 246, coupled to a forced air system for the delivery of heated air throughout the building envelope 100. Alternatively, HVAC unit 252 may be an electric resistant and/or forced air unit. In yet another embodiment, the access corridor comprises solar inverter panel 242, which may comprise an assembly for battery and charge controller. As would be readily apparent to one skilled in the art, core 205 may be configured to be delivered with any number of appropriate HVAC systems and controls pre-installed to facilitate construction of the building envelope 100.

In some embodiments, the core 205 may comprise an electrical panel 226 with breakers, outlets, switches, and disconnects. In other embodiments, alternate energy charging systems including solar inverter panel 242, with charge controllers and batteries may also be included in the core 205. The inclusion of electrical systems within the core 205 facilitates solar power stations and supply when used with, for example, thin film solar panels and/or coatings on the exterior walls 101 and/or roof 102 of the building envelope 100, or other alternative systems which may be plugged, as appropriate, into the incorporated charging systems. In one embodiment, core 205 may comprise LED lights and drivers, smart home controls and communications equipment (e.g., wireless receivers and transmitters), computers (including input devices such as touchscreens), performance monitoring equipment, electric service meters and connections, electrical
connections to appliances and HVAC systems, electric heating devices, exhaust fans, heat exchange units and fresh air intakes, grounding devices, alarm and monitoring systems, air quality monitoring systems and alarms, and fuel cells, among other things.

[0036] FIG. 3 is a profile view of a core 305 as seen from cut line 3 in FIG. 2. In the example shown in FIG. 3, core 305 may comprise walls 344 and 350 connected to floor diaphragm 356 and a ceiling diaphragm 354. As was discussed above, walls 344 and 350, and floor and ceiling diaphragms 354 and 356 may comprise any suitable material, including wood frame, OSB, or sheetrock. In some embodiments, core 305 may arrive on-site with plumbing and fixtures pre-installed, including shower pan 308 with a conventional three-piece enclosure (or, in the alternative, a bath tub), shower head valve assembly 310, a shower (or tub) drain assembly 364 attached to grey waste plumbing 304 (or, in the alternative, to black water waste plumbing 366). Core 305 may also include a removable wall panel 362 for access to shower/tub drain access plumbing from the utilities access corridor. Other pre-installed fixtures may include toilet 316 and lavatory sink 320, including counter and cabinet, connected to the plumbing system of core 305 via toilet supply 314 and lavatory sink supply pipe 318, respectively.

[0037] In some embodiments, wall 350 may form a portion of an exterior wall 101 of the building envelope 100. In these embodiments, the cavities of wall 350 may be filled with insulated spray foam, cellulose, or fiberglass insulation, as described above. Wall 344 may comprise a standard 100-amp electrical panel 326 including breakers, or any other suitable form of electrical panel. Core 305 may also comprise a passage 312, in some embodiments a door, into the utilities access corridor. In one embodiment, a wall mounted exhaust fan 360 may be mounted above passage 312 to exhaust air from the restroom portion of the core 305 via vent pipe 248. In yet other embodiments, a mechanical chase/plenum 358 may be mounted near the ceiling diaphragm of the core 305 in order to facilitate, among other things, stacking of cores for multi-level building structures.

[0038] FIG. 4 is a profile view one of the examples of the utilities access corridor of core 405 as seen from cut line 4 of FIG. 2. As was discussed in relation to FIG. 3, core 405 may comprise two walls 444 and 450 connected to floor diaphragm 456 and ceiling diaphragm 454. The utilities access corridor may comprise the majority of the utility runs and controls necessary to facilitate repair, inspection, and installation of the core 405. For instance, the water supply pipe 478 may enter the utilities access corridor and pass directly through hot/cold water supply manifold 438, then on to water heater 436 for distribution throughout the building envelope via a plurality of valves and pipes. An example of the water system is illustrated by the piping running to plumbing waste and supply stubs 440 (see also waste and supply stubs 240 in FIG. 2). Additional exemplary water distribution is shown in relation to the washer/dryer wall box 430, which includes plumbing waste and supply valves. As would be readily understood by one skilled in the art, the adaptive system disclosed herein may be employed with any number of appliances and fixtures including but not limited to those discussed above.

[0039] In one embodiment, the utilities access corridor of core 405 also includes an HVAC unit 452 coupled to a natural gas or LP manifold 446, and HVAC air return 472. In one embodiment, the HVAC unit 452 is elevated on a shelf 474 in order to facilitate access to the shower/tub drain assembly through a removable wall panel 362 (see FIG. 3). The utilities access corridor may also comprise a series of vent pipes 432 and 448 for air supply and exhaust to and from water heater 436 and washer/dryer set 428, as needed. In another embodiment, the utilities access corridor may include access to plumbing vent stack 480 coupled to a black waste plumbing 406 and a vertical exterior vent stack penetration 468. As described above, the utilities access corridor may also include grey waste plumbing 404. Furthermore, clamps 476 may be used to attach plumbing runs to the walls of the utilities access corridor for ready access and inspection thereof.

[0040] FIG. 5 is another profile view of another embodiment of core 505 comprising walls 544 connected to floor and ceiling diaphragms 554 and 556, as seen from cut line 5 of FIG. 2. In some embodiments, and as described above, core 505 may be delivered with fixtures (e.g., shower pan 508, shower head valve assembly 510, lavatory sink 520 with counter and cabinet, and washer/dryer wall box 530), utility runs (e.g., lavatory sink supply pipe 518, dryer vent pipe 532, open air return 570, and mechanical chase/plenum 558), and appliances (e.g., washer/dryer set 428 (not shown in FIG. 5) installed.

[0041] FIG. 6 illustrates an exemplary method 600 of constructing a prefabricated building comprising a core 105. It is to be understood that the steps disclosed herein are for illustrative purpose only, and that a variety of applicable methods are envisioned by the current application. Furthermore, and as is described below in relation to each method step, the method steps of method 600 may be completed concurrently, or in any number of possible chronological orders.

[0042] In a first method step 601, the core 105 is placed at a predetermined location. In one embodiment, a recess is created within a concrete poured slab. In some locales, building codes may require a crawlspace. However, thanks to in-floor hatch 202, a crawlspace may not be required except to satisfy building codes. Thus, in some cases a simple indentation, or dig-out, in the ground of the site may suffice for attaching the core 105 to pre-existing site infrastructure. In some embodiments, core 105 may be set on adjustable flanges using a threaded bolt assembly that may be embedded in the concrete slab or stem wall in order to guarantee same level top of floor between the core 105 and the building. Furthermore, the placement of the slab or other appropriate flooring system may be constructed prior to, after, or concurrently with the placement and installation of the core 105. For instance, in one embodiment, the core 105 may be placed prior to the placement of the remaining flooring of the prefabricated building. In another embodiment, the flooring may be prepared prior to placement and installation of the core 105. In yet another embodiment, the core 105 may be placed concurrently with the building envelope.

[0043] In a second method step 602, the core 105 is attached to pre-existing site utilities infrastructure. In one embodiment, the core can be rapid set and supply/waste connections completed, thereby facilitating the completion of construction tasks in parallel and significantly reducing time of construction of the prefabricated building. In yet another embodiment, the use of hydronic tubing within the slab may allow for connections to the core 105 (e.g., to manifolds 446 and 438, controls and HVAC unit 452). In one embodiment, the utilities of the integrated utility core 105 are not attached to the preexisting infrastructure until after optional method step 604, described in detail below.
In a third method step 603, the building envelope 100 is erected at the site. As has been discussed above, the building envelope 100 can be erected prior to, concurrently with, or after the placement and installation of the core 105. For instance, in one embodiment the prefabricated building envelope 100 may be erected prior to the on-site arrival of the core 105, and the core 105 may thereafter be "plugged" into the building envelope 100 upon arrival. Because the utility runs of the core 105 are contained with the core, delivered in a "usable" state, and designed to be accessed from within the utilities access corridor and/or the in-floor hatch, method step 603 may be completed in less time than that required to assemble traditional prefabricated buildings. In another embodiment, the building envelope 100 may be erected after placement and attachment of the core 105. In yet another embodiment, the building envelope 100 may be erected concurrently with the placement and attachment of the core 105.

In an optional method step 604, the core 105 may be jacked to above wall level and additional building cores may be placed thereunder. As would be readily understood by those of ordinary skill in the art, this method might allow for the completion of a multi-level prefabricated building without the use of, among other things, a crane. In the context of a humanitarian aid or disaster response scenario, this method step may facilitate the rapid construction of a structure designed to hold a large number of people. Once the desired number of levels of cores 105 are placed, they may be attached to pre-existing utilities infrastructure as described above in method step 602. Of course, as would be readily understood by one skilled in the art, the current application also contemplates stacking cores 105 using a crane or any other appropriate method.

As has been described above, the characteristics that enable building method 600 also allow the core 105 to be an efficient rapid set disaster response package. For instance, the cores 105 may be stockpiled for use in future natural disasters. In such embodiments and for such uses, the internal space within the core 105 (i.e., the space between walls 250 and 244) may be used as a storage and delivery container for emergency supplies, or, alternatively, as building components such as concrete, tools, and external fabric structures or hard panel temporary building structures for emergency use. Such an embodiment may facilitate the ability of core 105 to function as a standalone, self-contained emergency response package that can shelter and sustain a number of individuals with a single point delivery. Core 105 may also be configured to be affixed with an axle, wheels and tongue in order to facilitate transportation and/or delivery.

An added benefit of the core 105 is that after emergency use, the core 105 can remain in place or be mobilized to rebuilding areas and may be re-purposed into a permanent building, thereby speeding the recovery and rebuilding efforts after natural disasters, and recapturing the investment in transitional shelter with efficient and sustainable permanent building. In some embodiments, rather than constructing a building envelope 100 around the core 105 using materials that may be used in the long-term, a temporary material may be used. The temporary material may include fabric, corrugated metal, plastics, leaves, sticks, and branches, among other things. The core 105 may further comprise an outrigger frame to provide structural stability and support a building envelope 100 composed of temporary materials.

In one embodiment, the core 105 may be temporarily or permanently affixed to post and pier or other rapid set foundation methods, and, in some cases, temporary structure such as fabric or hard shell tents erected around it. Although this invention has been described in terms of certain preferred embodiments, other embodiments that are apparent to those of ordinary skill in the art, including embodiments that do not provide all of the features and advantages set forth herein, are also within the scope of this application. Accordingly, the scope of the present application is defined only by reference to the appended claims and equivalents thereof.

What is claimed is:
1. A prefabricated integrated utilities building core comprising:
   - a floor diaphragm;
   - four walls connected to the floor diaphragm, forming an interior of the prefabricated integrated utilities building core;
   - a utilities access corridor situated within the floor diaphragm and the four walls, and comprising at least one access wall comprising a passage configured to provide access to and from the utilities access corridor from the interior of the prefabricated integrated utilities building core;
   - a plurality of integrated utilities arranged within the prefabricated integrated utilities building core to be fully accessible from the utilities access corridor, and wherein the plurality of integrated utilities comprises (a) plumbing, (b) electrical, and (c) HVAC; and
   - an in-floor access hatch arranged within the utilities access corridor and configured to provide access to an in-floor portion of at least the plumbing of the plurality of integrated utilities.
2. The prefabricated integrated utilities building core of claim 1 further comprising grey waste plumbing.
3. The prefabricated integrated utilities building core of claim 1 wherein at least the plumbing of the plurality of integrated utilities runs within the floor diaphragm.
4. The prefabricated integrated utilities building core of claim 1 further comprising a plurality of fixtures attached in a finished state.
5. The prefabricated integrated utilities building core of claim 4 wherein the plurality of fixtures comprises at least two of (1) a toilet, (2) a sink, (3) a bathtub, and (4) a shower.
6. The prefabricated integrated utilities building core of claim 1 further comprising at least one appliance attached in a finished state.
7. The prefabricated integrated utilities building core of claim 1 wherein the HVAC of the plurality of integrated utilities further comprises a hydronic system.
8. A method of constructing a building comprising a prefabricated integrated utilities building core, wherein the method comprises:
   - placing a prefabricated integrated utilities building core at a predetermined position on a site, wherein the prefabricated integrated utilities building core comprises a floor diaphragm connected to four walls, a utilities access corridor comprising an interior passage, and a plurality of integrated utilities comprising plumbing, electrical, and HVAC;
   - attaching the plumbing of the plurality of integrated utilities to preexisting infrastructure at the site through an in-floor access hatch in the floor diaphragm of the utilities access corridor; and
erecting an exterior envelope around the predetermined site position of the prefabricated integrated utilities building core.

9. The method of claim 8 wherein the method step of attaching the plumbing to the preexisting infrastructure comprises accessing plumbing contained within the floor diaphragm.

10. The method of claim 8 wherein when placing the prefabricated integrated utilities building core at the predetermined position on a site, all fixtures and appliances of the prefabricated integrated utilities building core are already installed in a finished state.

11. The method of claim 8 wherein the method step of erecting an exterior envelope further comprises omitting an area of flooring to receive the prefabricated integrated utilities building core.

12. The method of claim 11 further comprising forming a dig-out at the area created in the flooring to receive the prefabricated integrated utilities building core.

13. The method of claim 8 further comprising placing a second prefabricated integrated utilities building core so as to form a stack of prefabricated integrated utilities building cores.

14. The method of claim 13 wherein the second prefabricated integrated utilities building core is jacked above wall level.

15. A re-purposable building structure comprising:
a prefabricated integrated utilities building core comprising:
a floor diaphragm;
four walls connected to the floor diaphragm, forming an interior of the prefabricated integrated utilities building core;
a utilities access corridor situated within the floor diaphragm and the four walls, and comprising at least one access wall comprising a passage configured to provide access to and from the utilities access corridor from the interior of the prefabricated integrated utilities building core;
a plurality of integrated utilities arranged within the prefabricated integrated utilities building core to be fully accessible from the utilities access corridor, and wherein the plurality of integrated utilities comprises (a) plumbing, (b) electrical, and (c) HVAC; and
an in-floor access hatch arranged within the utilities access corridor and configured to provide access to an in-floor portion of at least the plumbing of the plurality of integrated utilities; and
an exterior envelope enclosing the prefabricated integrated utilities building core.

16. The re-purposable building structure of claim 15 wherein the exterior envelope comprises a temporary material.

17. The re-purposable building structure of claim 16 wherein the temporary material comprises fabric.

18. The re-purposable building structure of claim 16 wherein the temporary material is supported by an outrigger frame.

19. The re-purposable building structure of claim 15 further comprising a rain pan connected to the prefabricated integrated utilities building core.

20. The re-purposable building structure of claim 19 wherein the rain pan comprises at least one of (1) a water filtration system, and (2) ballast.

* * * * *