

Height Adjustable Shipping Container

Field of the Invention

5 The invention relates to a **Height Adjustable Shipping Container** for use as a building structure, typically for housing and/or mining accommodation.

Background of Invention

10 A problem with existing methods of shipping standard shipping containers lies in the height and transport costs of a product which does not take up the full space within the container particularly where the container is to be used as some form of accommodation or commercial use. In such cases the interior of the container is often almost empty but because the eventual residential height in the container is full height the transport costs are high.

15 Equally, where accommodation which is greater than the height of a shipping container must be provided the only real option is to provide it as two containers, one without floor, which must be mounted on top of each other.

Prior References:

20 All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications may be referred to herein; this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

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Object of the Invention

It is an object of the invention to provide a height adjustable shipping container that ameliorates some of the disadvantages and limitations of the known art or at least provide the public with a useful choice.

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Summary of Invention

In a first aspect as herein described the invention relates to a height adjustable transportable shipping container usable as a building structure, wherein the transportable expandable shipping container houses during transportation within a minimum of two roofs and two
10 floors such that when the transportable expandable shipping container is expanded for use as a building structure the transportable expandable shipping container makes up a minimum area of that of two standard shipping containers, the height adjustable shipping container having:

- 15 (i) vertical corner members and at least interchangeable and relocatable three side walls which may be transported at a reduced height as a shipping container and expanded at the receiving end wherein at least some of the vertical corner members expand in length during expansion of the reduced height shipping container and the shipping container is capable to house and to transport therein structural components, such as wall panels, floor, roof and even fittings to erect a
20 building structure that is the equivalent in floor area to that of at least two shipping containers;
- (ii) at least some part of a side wall is attached to an upper part of the height adjustable container during expansion and at least some other part of an interchangeable and relocatable side walls is attached to the lower part of the
25 height adjustable container during expansion, the lower part of the interchangeable and relocatable side walls is substantially high enough to accommodate building components, fittings, furniture and fixtures below its height; and

- (iii) the vertical members including a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart vertical members,

5 wherein further when the container is in an unextended position the height of the container is at a reduced height of at least 50% to that of a standard shipping container and such that when the container is in the extended position the container is at a height equal to that of a habitable area or greater than the height of a standard shipping container and the erected side walls are coaxially aligned to form outer walls having a flat planar surface along the entire surface area of the outer wall.

10 Preferably the vertical corner members are vertical rails or columns.

Preferably at least some part of a side wall is attached to an upper part of the height adjustable container during expansion.

Preferably at least some other part of a side wall is attached to the lower part of the height adjustable container during expansion.

15 Preferably the lower part of the side walls is substantially high enough to accommodate furniture below its height.

Preferably the lower part of the side walls is substantially 0.9 metres high.

Preferably the upper part of the side walls is substantially 0.3 metres high.

Preferably access points for utility services are at the junctures of the upper and lower walls.

20 Preferably at least part of a wall filling the gap between upper and lower shipping container parts is pulled into place on expansion of the container.

Preferably elements forming the shipping container walls during transport may be relocated elsewhere within the container after expansion.

Preferably the shipping container top surface is angled with respect to the plane of the floor.

25 Preferably two such expanded top surfaces may be placed side by side to form a peaked pitched roof.

Preferably the floor of the shipping container may act to receive a pourable settable material and may include elements acting as reinforcement for the settable material.

Preferably the reinforcement elements may extend through two adjacent expanded shipping container floors.

Preferably the shipping container corner members may include telescoping portions in which any engagement features in the corner rail top are substantially repeated in the top of each
5 telescoping portion.

Preferably in the expanded form the corner members remain capable of supporting vertical loads.

Preferably, the expandable vertical members include a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart
10 expandable vertical members.

Preferably, the floor includes spaced apart openings adapted to receive the tines of a fork lift to allow the unerected shipping container to be easily transported and are adapted when the shipping container is erected to used as service ducts.

Preferably, the vertical corner members have an open cross section.

15 Preferably, the vertical corner members have a substantially 'L'-shaped cross section.

In another aspect as herein described the invention relates to a method of manufacturing a transportable expandable shipping container for use as a building structure, wherein the transportable expandable shipping container during transportation houses within a minimum of two roofs and two floors such that when the transportable expandable shipping container
20 is expanded for use as a building structure the transportable expandable shipping container makes up a minimum area of that of two standard shipping containers, the method includes:

- (i) providing a container base and vertical members, providing at least one first vertical wall portion adapted to be attachable to the base and adapted to extend less than the packaged height of the container, providing an
25 upper surface secured at least in one position to an upper portion of a vertical member, providing at least one second vertical wall portion adapted to extend towards the first vertical wall portion from the upper surface the vertical members having a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two
30 spaced apart expandable vertical members;

- (ii) extending the members to an expanded position;
 - (iii) attaching at least some part of an interchangeable and relocatable side walls to an upper part of the height adjustable container during expansion; and
 - 5 (iv) attaching at least some other part of the interchangeable and relocatable side walls to the lower part of the height adjustable container during expansion whereby the lower part of the side walls is substantially high enough to accommodate building components, fittings, furniture and fixtures below its height;
- 10 wherein when the container is in an unextended position the height of the container is at a reduced height of at least 50% to that of a standard shipping container and when the container is in the extended position the container is at a height equal to that of a habitable area or greater than the height of a standard shipping container and the erected side walls are coaxially aligned to form outer walls having a flat planar
- 15 surface along the entire surface area of the outer wall.

In further aspect as herein described the invention relates to a transportation system for the transportation, packaging and erection of a transportable height adjustable shipping container usable as a building, the transportable expandable shipping container during a transportation mode houses within a minimum of two roofs and two floors such that when the transportable

20 expandable shipping container in a building mode for use as a building structure the transportable expandable shipping container makes up a minimum area of that of two standard shipping containers, the transportation system including an external building shell transformable from the transportation mode to the building mode, when in the transportation mode the external building shell falls within same floor dimensions and floor area of a

25 shipping container format, the external building shell being height adjustable such that the external shell is adapted to be transformed from the transport mode to the building mode by adjusting the height of the external building shell to a desired height, when in the transportation mode the internal space within the external building shell includes structural components, such as building components, wall panels, floor, roof fittings, furniture and

30 fixtures required to erect and fit out a building structure that is the equivalent in floor area to that of at least two shipping container formats; the external building shell includes:

- a) vertical corner members and at least three interchangeable and relocatable side walls which may be transported at a reduced height as a shipping container and expanded at the receiving end wherein at least some of the vertical corner members expand in length during expansion of the reduced height shipping container;
- 5 b) at least some part of an interchangeable and relocatable side walls is attached to an upper part of the height adjustable container during expansion and at least some other part of the interchangeable and relocatable side walls is attached to the lower part of the height adjustable container during expansion, the lower part of the side walls is substantially high enough to accommodate the structural components, such as
- 10 building components, wall panels, floor, roof fittings, furniture and fixtures, below its height when in the transportation mode; and
- c) the expandable vertical members having a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart expandable vertical members,
- 15 wherein the transportation system when in the transportation mode the external building shell is at a reduced height of at least 50% to that of a standard shipping container and such that when in the building mode the external building shell is at a height equal to that of a habitable area or greater than the height of a standard shipping container and the erected side walls are coaxially aligned to form outer walls having a flat planar surface
- 20 along the entire surface area of the outer wall.

Brief Description

The invention will now be described, by way of example only, by reference to the accompanying drawings:

- 25 **Figure 1** is a height adjustable shipping container in accordance with a first preferred embodiment of the invention,

Figure 2 is the container of **Figure 1** in an expanded position.

Figure 3 is a variation of the container of **Figure 1**,

Figure 4 is an assemblage of two containers as shown in **Figure 3**.

- Figure 5 is a prefabricated floor assembly suitable for a container.
- Figure 6 is detail of a joint between two prefabricated floor assemblies of Figure 3.
- Figure 7 is a detail of a telescoping expanding vertical container rail.
- Figure 8 is a side view of a section of a compacted accommodation container.
- 5 Figure 9 is a side view of the container of Figure 8 in expanded form.
- Figure 10 is a perspective view of collapsed containers situated on a truck trailer ready for transport in accordance with a second preferred embodiment of the invention.
- Figure 11 is a perspective view of one of the collapsed containers shown in figure 10.
- Figure 12 is a perspective view of the container shown in figure 11 in expanded form.
- 10 Figure 13 is an end view of the container shown in figure 12.
- Figure 14 is a further alternate end view of the container shown in figure 12.
- Figure 15 is a perspective cut-away view of the container shown in figure 12.
- Figure 16 is a top view of the container shown in figure 15.
- Figure 17 is a perspective view of the lower frame of the container shown in figure 12.
- 15 Figure 18 is a perspective view of the lower frame shown in figure 17 without side panels and floor.
- Figure 19 is a top view of the lower frame shown in figure 18.
- Figure 20 is a perspective view of the upper frame of the container shown in figure 12.
- Figure 21 is a side view detail of a telescoping expanding vertical container column.
- 20 Figure 22 is a detail of the lower and upper portions of the column shown in figure 21.
- Figure 23 is a side cross-sectional view of part of the container as shown in figure 12.
- Figure 24 is a perspective view of a packaged unerected container in accordance with a third preferred embodiment of the invention.
- Figure 24A is a perspective exploded view of the container as shown in figure 24.
- 25 Figure 24B is a perspective view of the lower part of the packaged unerected container as shown in figure 24.

- Figure 24C is a perspective view of the container as shown in figure 24 in an erected state.
- Figure 24D is a perspective view of an assembled building.
- Figure 24E is a perspective view of a further partially assembled building created from two containers as shown in figure 24.
- 5 Figure 24F is a perspective view of a fully assembled building as shown in figure 24E.
- Figure 24G is a perspective view of another assembled building.
- Figure 24H is a perspective view of another partially assembled building.
- Figure 24I is a perspective view of the building as shown in figure 24G in a completed state.
- Figure 24J is a perspective view of a container ready for transport.
- 10 Figure 24K is an partial exploded view of the container shown in Figure 24J
- Figure 25 is a perspective view of a packaged unerected container in accordance with a fourth preferred embodiment of the invention.
- Figure 25A is a perspective exploded view of the container as shown in figure 25.
- Figure 25B is a perspective view of the lower part of the packaged unerected container as
- 15 shown in figure 25.
- Figure 25C is a perspective view of the container as shown in figure 25 in an erected state.
- Figure 25D is a perspective view of an assembled building.
- Figure 26 is a perspective view of a packaged unerected container in accordance with a fifth preferred embodiment of the invention.
- 20 Figure 26A is a perspective exploded view of the container as shown in figure 26.
- Figure 26B is a perspective exploded view of the container as shown in figure 26 in an erected state.
- Figure 26C is a further perspective exploded view of the container as shown in figure 26 in an erected state.
- 25 Figure 26D is a perspective view of the lower part of the packaged unerected container as shown in figure 26.
- Figure 26E is a perspective view of the container as shown in figure 26 in an erected state.

Figure 26F is a perspective view of an assembled building.

Figure 26G is a perspective exploded view of another partially assembled building.

Figure 26H is a perspective view of a fully assembled building as shown in figure 26G.

Figure 27 is a perspective view of a container in kit form.

5 **Figure 27A** is an exploded view of the container as shown in figure 27.

Figure 28 is a perspective view of a container in layered schematic form.

Figure 28A is an exploded view of the container as shown in figure 28.

Description of the Preferred Embodiment(s):

10 The following description will describe the invention in relation to preferred embodiments of the invention, namely a height adjustable shipping container. The invention is in no way limited to these preferred embodiments as they are purely to exemplify the invention only and that possible variations and modifications would be readily apparent without departing from the scope of the invention.

15 The inventive construction system is applicable for use as residential housing, domestic garages, machinery & farm sheds, emergency accommodation, etc.

 The invention relates to a new system for the construction and transportation of accommodation that has many benefits compared to existing systems. The proposed system possesses a significant reduction in the net cost of production, and it addresses and resolves
20 issues in the systems currently available.

 Generally the invention pertains to an external building shell that is delivered and erected in minimum time, which may be as little as a few hours in some construction cases (eg: garages). As the building shell is fully enclosed, there are no weather limitations on the construction timeline. Local tradesmen may be engaged to do the internal installations thus
25 promoting the local construction industry and stimulating the local economy, which is desired by councils and governments. The highly skilled local workers are likely to be more efficient than low-skilled, cheaper workers from foreign economies, and as weather conditions would not be a factor, these local workers would be more able to work with optimum efficiency and remain economically competitive compared to the global market.

The inventive system is formatted around the ISO shipping container design, and is easily transported and positioned using equipment that is readily available. Due to the simplicity of the on-site setup of the building shell, for uncomplicated projects a low skill set is necessary to complete the required assembly. The finished erected building meets international bush
5 fire building regulations.

In emergency accommodation situations, the ease of building erection and fully enclosed nature of the system mean that homeless people can have immediate shelter and security. In the collapsed container state, the inventive system can also be used to transport and store emergency relief materials, such as food and building resources, within the collapsed
10 container.

Due to the versatility of the inventive system, including the potential to connect many individual containers together, it is possible to quickly create a large, sheltered and secure space that can be used for a variety of purposes, such as a hospital, a food storage facility, or for occupancy by many families. This latter use could also promote a sense of community
15 living, helping to provide comfort to people affected by disasters.

The side panels that are used as bracing when the building unit is being transported can be relocated to the outer shell of the erected frame to create a combination of external walls, windows and door openings. The panels, windows and doors are interchangeable, and able to create a large number of different formats as desired.

20 Turning now to the drawings that exemplify the invention.

Figure 1 shows a height adjustable shipping container 101 in which vertical corner rails extend to trucking and lifting points 102 at each end. Vertical walls on the exterior extend to cut line 105 forming partial end panel 103, partial side panel 104 and top panel and top side
partial panels 106.

25 Figure 2 shows the container of Figure 1 in expanded form in which telescoping rails 107 have been expanded, a panel 110 formerly behind panel 103 has been pulled up into place and a window 108 formerly packed inside the container with windows 109 has been placed in the gap formed by expansion. Other panels or equipment which may have been packed within the container, such as doors, roller doors, ventilators, tables, etc can be fitted to the
30 expanded container. Still others may be permanently fitted to the container before dispatch, such as lighting or plumbed fittings.

Figure 3 shows a container 111 with a tilted top forming part of a peaked pitched roof 112 and an end panel 113. Cut lines 105 are offset, providing for different panel fitments at each cut. Typically any services required in the container (plumbing, electrical) are located adjacent a joint line to allow easy servicing and testing on installation. Figure 4 shows two
5 containers such as that of Figure 3 butted together before being expanded into a single larger accommodation structure. Various of the walls may be shifted in position when expanded, so that for instance the end panels 113 may be relocated to fill the other end leaving one end open for access.

In an alternative the two containers may be spaced apart and parts for bridging the gap
10 between may be packed with the containers. This may include, for instance, flooring and a roof ventilation bridge.

Figure 5 shows a view of a floor pan for a container which is intended to be static. It consists of an edge structure 501 and reinforcing bars 502 to allow the pouring of concrete or some other settable pourable material into the pan at the final site, producing a reinforced
15 concrete pad within the container.

Figure 6 displays a method of carrying the reinforcing 603 through containers abutted and secured together as in Figure 4 so that edge rails 601, 602 are adjacent to render the concrete pad continuous.

Figure 7 shows a view of a telescoping pole in expanded form. A lower portion 701 with
20 engagement feature 703 for trucking or lifting has a cap 702 which slides down over portion 701. When slid down the engagement features 704 align with those at 703 to allow lifting the compacted container.

Figure 8 shows a side view of the interior of an accommodation container. External panels 801, 802 have a cut line between them allowing compacting of the container onto chair 803,
25 sink and faucet 804, desk 805 and lights 806, 807. Plumbing, electricity and any other utility services for the lights, wall power and sink may be located in areas 808 at the junctures of the cut line, providing access to services before the container is collapsed and after it is expanded. These services may be located within channels at the top of bottom of a wall attached to the container structure.

30 The cut line for such accommodation is preferably at 900mm above the floor with panel 801 being 300mm high to give a compacted height for the container of 1200mm compared to the

full standard height of 2500mm or 2900mm. This means that normal furniture can be accommodated within the compacted container.

Figure 9 shows the same container in expanded form with the cut lines spaced apart by panels 810. Before panels 810 are finally placed the services are connected, for instance by
5 cables from lights 806, 807 being connected to a central connection board within areas 808 by sockets or by connector block. This has the advantage that access is relatively easy while the container is being expanded on site.

It is important that the compacted container still adheres to the measurements of a standard shipping container which means that in some cases a collapsed telescoping pole will still
10 stand above part of the structure of a containerised building, as in Figure 3.

Figure 10 shows a truck transporting the shipping containers of the invention. Each container 1001 to 1006 is of a collapsed and reduced size or height relative to a standard shipping container. Each shipping container 1001 to 1006 includes all the components, including framing, walls, panels, etc., required to erect a building structure such as for mining,
15 accommodation and/or commercial purposes.

Figure 11 shows a shipping container 1000 in its storage and transportation state. The container has a chassis 1010 with side beam 1011 and end beam 1012. Side beam 1011 has at least two spaced apart fork lifting pocket openings 1013. The side and end beams 1011, 1012 connect with lower standard ISO corner element 1054 at the base of column 1050. The
20 column 1050 includes a lower section interleave guide part 1051 and an upper section interleave guide part 1052 where the upper section interleave guide part 1052 telescopes within the lower section interleave guide part 1051 such that the height of the container 1000 can be adjusted in order to form a building structure when transported to the desired location. The container 1000 has side walls 1060, end walls 1030 and roof 1040. The column 1050 has
25 an upper standard ISO corner element 1053.

Figures 12 and 13 show the container 1000 in an erected state in which the columns 1050 are fully extended. The erected container is shown with end wall panels 1031, 1032, side wall panels 1062, 1063, 1064, 1065, 1067, 1068 and door 1066, 1082. End wall panel 1031 and side wall panels 1063, 1064 are fixed in place whereas end wall panel 1032 and side wall
30 panels 1065, 1065, 1067 & 1068 are removable. Side panels 1061, 1062 open out to form

eaves, awning or shade panels and can be connected to another adjacent container to form a shelter walkway/porch area.

Figure 14 shows a variation to the container 1000 shown in figure 13 in that figure 14 includes a plumbing drainage component 2300 beneath the floor of an assembled and erected container 1000. Preferably the plumbing draining 2300 is transported within the container and connected in place once the container is sited and erected in the desired place.

Figures 15 and 16 show a cutaway view of an assembled and completed container 1000. The container 1000 is shown to include a bedroom 2101, lounge area 2102, kitchen area 2103, bathroom 2104 and toilet 2115. Preferred fittings, appliances and amenities shown are microwave 1805, fridge 1806, hot water tank 1807, locker 1808 and water closet 1809. It is envisaged that other fittings, appliances and amenities can be utilised to suit the purpose to which the erected and completed container is to be used for.

Figures 17 and 18 show the lower frame 1000A of the container. Figure 17 shows the lower frame in an assembled state with floor LA, side panels, and end panels in place. The end walls 1030, 1070 consist of end beams 1012, 1015 and structural service duct supports 1701, 1708 connected to and spaced apart by lower section interleave guide columns 1051. The side walls 1060, 1080 include side beams 1011, 1014 connected to the lower part of lower section interleave guide columns 1051. The structural service duct supports 1702, 1705, 1707, 1709, 1712, 1714 are spaced respectively above the side beams 1011, 1014 by the combination of the lower section interleave guide columns 1051 and vertically extending door posts 1703, 1704 and structural service duct supports 1706, 1710, 1711, 1713 to form sub frames to define walls for panels and windows and openings 1069A, 1085A for doors. The upper structural service duct supports, 1701, 1702, 1705, 1707, 1708, 1709, 1712, 1714 can include slotted holes in which windows and wall panels can be inserted and held in place without the need to use fasteners or the like to hold windows and panels in place.

Figure 19 shows the floor F of the container. The floor consists of a frame including side beams 1011, 1014 and end beams 1012, 1015 that are connected at the ends to the base of columns 1050. At spaced intervals between side beams 1011, 1014 are connected floor joists 1016. Situated equally spaced apart from the centre of the floor frame are fork lifting support compression plates 1017 that are hollow to accommodate the forks of a fork lift. The floor F as shown in figure 19 is included in the unerected container and is assembled and erected

onto ground or piles or the like at the desired location upon which the container is then lowered and erected thereto. A pourable, settable medium such as cement is then poured (or this can be done prior to the container being put in place) to form a concrete floor.

To construct the floor, reinforcement steel is fixed inside the container and positioned so that
5 concrete or another setting medium can be installed immediately and under cover. The skill requirement for floor construction is low as there is a relatively small distance between the form boards, which are of a uniform height. This allows for easy levelling of the concrete. The cement for the concrete can also be transported within the collapsed container shell. Concrete would also provide a floor capable of being easily decontaminated and cleaned,
10 which is essential for use in hospitals.

Figure 20 shows the upper frame 1000B of the shipping container. The upper frame 1000B consists of upper side section structural members 1091, 1094 connected to upper end section structural member 1092, 1093, upper standard ISO corners 1053 of upper section interleave guide columns 1052. Structural service duct supports 1095 are situated spaced apart between
15 the upper side section structural members 1091, 1094 in order to provide structural support. Lower upper side section structural members 1097, 1098 extend spaced below the upper section structural members 1091, 1092, 1093, 1094. Structural service duct supports 1099 extend between the upper side section structural members 1091, 1094 in order to provide further structural integrity to the upper frame 1000B. Depending down from the Lower upper
20 side section structural members 1097, 1098 are door post spigots 1096 situated in position where a door is to be situated and supported there under. The upper frame 1000B can include fork lifting support compression plates (not shown) similar to the compressions plates 1017 in figure 19. These compression plates that are hollow accommodate the forks of a fork lift to allow the upper frame to be raised and situated in place when erecting a
25 building structure.

Figures 21 and 22 show aspects of the expandable column 1050. The column is attached at its base to the side beam 1011 by standard ISO corner 1054. The column 1050 consists of three telescoping hollow interleave guide columns 1051, 1055 and 1062. Lower section interleave guide column 1051 is connected at its lower end to standard ISO corner. Centre
30 section interleave guide column 1055 is of a smaller diameter to that of both interleave guide columns 1051 and 1052 such that centre section interleave guide column 1055 is able to telescope within interleave guide columns 1051, 1052 such that when the container is in a

storage and transport state centre section interleave guide column 1055 is fully enclosed within interleave guide columns 1051, 1052. Upper interleave guide column 1052 is attached to the upper standard ISO corner 1053 and also can be of a smaller diameter to that of lower section interleave guide column 1051 such that in the unerected state part of upper section
5 interleave guide column 1052 fits within lower section interleave guide column 1051.

The standard ISO corners 1053, 1054 include holes 1056, 1057 that are able to act as lifting points so that the interleave guide columns 1052, 1055 can be raised and lowered relative to lower section interleave guide column 1051.

Figure 23 shows a cross-sectional view of part of an erected container. There is shown a
10 floor F supported on floor joists 1016 fixed to side beam 1010 that supports a lower wall panel 1063, service duct support 1705, upper wall panel/window 1067 that all form part of side wall 1060. Side panel 1061 fastened to side wall 1060 during transport made by fasteners 1716 is used as an awning or extended eave or shutter when and once the container is erected and assembled. Side panel 1061 also acts during transport as a shock absorber and
15 as a brace. A ceiling panel 1720 extends transversely from and connected to, via corner internal coving 1715, the top of wall panel/window 1067 and is situated below roof 1040. An air gap exists between the ceiling panel 1720 and roof 1040 which can be used as part and connected to an air conditioning system.

Figures 24 and 24A show a packaged container 2400 ready for transport (minus the side
20 panels). The container 2400 consists of a floor base 2401, roof sections 2402A, 2402B, further wall/roof sections 2403, 2404 and columns 2405. Figure 24B shows a partial assembled container 2400 in which the roof section has yet to be raised relative to the base 2401 by adjusting the columns 2405. Figure 24C shows the container in a fully erected state ready to be fit out and completed. Figure 24D shows a building structure of an area equally
25 to area of two containers 2400, 2410 joined side by side to the form a building structure. Figures 24E & 24F show two assembled containers 2400, 2410 joined together by a covered roof/walkway 2420. Whilst in the lower un raised position such as that shown in Figure 24E roofing, eaves and other roof and ceiling related components and fittings for ease of assembly and occupational health and safety requirements. Figure 24G & 24I shows a
30 building structure 2430 having two levels and equal in area to that of that of eight shipping containers. Figure 24H shows a building structure 2440 equal in area to that of that of three shipping containers. Figure 24J & 24K shows a container 2400 in ready condition and

configuration for transportation showing floor base 2401A, 2401B, roof sections 2402A, 2402B, columns 2405 and wall panel sections 2406, 2407, 2408, 2409. It is envisaged that one container includes enough components to build a building structure the equivalent in floor area to that of at least two shipping containers.

- 5 Figures 25 and 25A show a packaged container 2500 ready for transport (minus the side panels), The container 2500 consists of a floor base 2501A, 2501B, roof sections 2502A, 2502B, further wall/roof sections 2503, 2504 and columns 2505. Figure 25B shows a partial assembled container 2500 in which the roof section has yet to be raised relative to the base by adjusting the columns 2405. Figure 25C shows the container 2500 in a fully erected state
10 ready to be fit out and completed. Figure 25D shows a building structure 2520 formed and equal in area to that of that of eight shipping containers.

- Figures 26 and 26A show a packaged container 2600 ready for transport (minus the side panels), The container 2600 consists of a floor base 2601, roof sections 2602A, 2602B, further wall/roof sections 2603, 2604 and columns 2605. Figures 26B & 26C shows
15 exploded views of the container 2600 in an erected state. Figure 26D shows a partial assembled container 2600 in which the roof section has yet to be raised relative to the base by adjusting the columns. Figure 26E shows the container in a fully erected state ready to be fit out and completed. Figure 26F shows a building structure 2620 formed and equal in area to that of that of four shipping containers. Figures 26G & 26H shows a building structure
20 2630 formed and equal in area to that of that of four shipping containers and has a covered walkway/roof.

- Figures 27 & 27A show the container 2700 in kit form identifying the key components required to build a building structure of at least equal in area to the floor area of two shipping containers combined. The kit includes floor base 2701A, 2701B, 2701C, 2701D, roof
25 sections 2702A, 2702B, columns 2705, centre roof panels 2706, 2707, extra columns 2708, and eave panels 2709, 2710.

- Figures 28 & 28A show the container 2800 in a layered schematic form identifying the key components required to build a building structure of at least equal in area to the floor area of two shipping containers combined. The kit includes floor base 2801A, 2801B, 2801C,
30 2801D, 2801E, 2801F, 2801G, roof sections 2802A, 2802B, 2802C, 2802D, columns 2805, centre roof panels 2806, 2807, extra columns 2808, and eave panels 2809.

The columns may include a horizontal steel channel to support a beam between the columns. The beam could be of concrete, steel, wood or similar suitable material adapted to bear and support a load such that of an upper floor.

The fork lift pockets can be used for the carriage of services once the floor is concreted

- 5 The upper and lower frame parts can be delivered together to eliminate sequence confusion that currently exists with known methods.

The unassembled parts can be transported on a frame so that they can be assembled at the point of destination and thus allowing the transportation of a greater floor and roof area

- 10 High quality external finishes, such as cladding or brickwork, can be installed to create a more traditional appearance. Paint and/or texture patterns, such as roof tiles or bricks, could also be printed into the steel panels. Internal walls can also be easily constructed including insulation, plaster board and paint.

If a wider building is desired, additional infill sections may be installed on the roof and floor, connecting two housing module units on either side.

- 15 The building units may be used to rapidly and cheaply construct a double garage.

Multi-storey buildings are envisaged whereby building shells can be erected on top of another. Floor pans can be installed to the concrete sections for the construction of a second-storey concrete (or other medium) floor, which can also be fire rated.

- 20 Any existing building format can be replicated. Eaves, valleys, hips and other traditional building features are designed into the system.

Builders can program projects without the weather constraints that currently exist. This would maximise efficiency of labour and capital, and as progress is not limited by adverse weather conditions, it would create more stable cash flows and a more stable and predictable building industry.

- 25 In 2011, the prefabricated housing market in America alone produced 185,000 units and was worth US\$8-6 billion. This is a big market, and this method will significantly reduce the cost of the building shell, and could potentially revolutionise the industry by supplying more efficient, affordable housing.

The versatility of the construction design enables the inventive system to be used to create a vast variety of buildings for different applications including, but not limited to, residential housing, storage units, sheds, garages, and buildings for emergency relief, public or commercial use.

- 5 The new inventive building system has many applications for portable/ modular buildings, and a major use for such buildings is in mining camp accommodation.

The modular building industry is less than five years old and has undergone many developments that have led to greater efficiencies over this time. However there is a need for even more efficient and serviceable products. The new and inventive system for the
10 construction and transportation of portable housing accommodation has many benefits and improvements compared to existing systems. The proposed inventive system possesses a significant reduction in the net cost of production, and it resolves issues in the systems currently available.

- The product requires minimal on-site setup, with fully complete interior fittings and services.
15 The collapsed building shell simply needs to be placed, erected and centre panels inserted, which takes minimal time.

The inventive system allows for the access of all services with ease, and allows for upgrading, testing and repair if required at any time.

- The inventive system addresses occupational health and safety issues and reduces the risk of
20 personnel injury during construction. As it has been fully designed considering safety.

The inventive system is formatted around the ISO shipping container and is easily transported and positioned using readily available equipment.

- The storage space required is reduced by 50%, so transportation costs are also reduced by up to 50% or more, which is a considerable cost advantage. Furthermore, twice as many units
25 can then be delivered in the same amount of time.

The manufacturing process has been designed so that different components may be constructed at different sites, and services can be installed depending on the local government standards, e.g. wiring colours, plumbing, etc. Installation of services and amenities would occur at the final assembly stage.

- 30 Covered walkways and balconies can be included in the design.

The inventive system can be used for mining and military accommodation, and emergency relief, and it is light enough that it could be air dropped from a cargo plane

As the fuel and transport costs are greatly reduced, the inventive system is 'greener' than current systems and would be eligible for carbon credits

- 5 The inventive system has been designed to be mass produced using a similar method as is used in the automobile industry.

It is estimated that over the next 5 years, accommodation will be needed for millions of mine workers.

- 10 The location of service ducts horizontally are at the level that services are required i.e. at bench height 900mm approx and then a 1150 mm approx spacing panel and then another service duct for lighting and then a top panel above to the ceiling junction. The roof section is situated in place last and thus capturing the panels in position and then fastening the roof section to the columns for transport.

- 15 As the inventive system allows for more than one building shell to be transported multiple and individual building sections can be coupled together to create a wider building structure.

The finished building structure can have a sloping roof that would be more aesthetically pleasing and allow water or snow to run off the roof and also create a void between the ceiling and roof for ventilation and a more efficient insulation roof area,

- 20 The inventive system can utilise spreader pieces to the roof and floor and thus increase the overall width of a completed building where two or more building shells are to be joined together to form a single building structure.

- 25 By enclosing the external faces of the transported container sections with protection panels that can be relocated to complete the external walls, the protection panels serve the purpose as a bracing component and a shock absorber to absorb destructive energy during transport caused by pot holes or bumps in road surfaces and other unknown factors during transport. These panels could be installed in such a way to allow window and door openings. This provides an exterior shell of a building that could then be completed in a conventional manner. A concrete floor slab as the base gives the building mass to hold the building down. A concrete slab can be added to the top of the container when used in a high rise situation.

The columns can also be filled with concrete or other suitable material from the top. Reinforcement material such as steel rods can also be installed inside the columns. Thus the finished building will have the sufficient structural integrity and fire rating capacity.

5 The inventive system generally comes with a horizontal roof which is easier to store, transport and install and can be stacked to many levels if required

The inventive system can be transported 2, 3 or more high on a truck or carriage in a near complete state (see figure 10)

The inventive system can be pre certified and easily adapted to suit all regions world wide

10 The inventive system requires minimal on-site setup, with fully completed interior fittings and services. The inventive system simply needs to be placed, erected and centre panels inserted reducing commissioning times and reducing costs.

The inventive system allows for easy access of all services, and allows for upgrading, testing and repair if required at any time.

15 The manufacturing process has been designed so that different components may be constructed at different sites, and services can be installed depending on the local government standards, eg: wiring colours, plumbing, etc. installation of services and amenities would occur at the final assembly stage.

Covered walkways and balconies can be included in the design by utilizing the side panels.

20 The product can be used for mining and military accommodation, and emergency relief, and it is light enough that it could be air dropped from a cargo plane

The inventive system has been designed to be mass produced using a similar method as is used in the automobile industry. There is nothing of this kind on the market.

Eave overhangs, valley panels and other sections that may be required can be installed to the building.

25 **Drawings Number Description List**

1000	Container
1000A	Lower Section
1000B	Upper Section
1001	Collapsed Container - Transport Arrangement

	1002	Collapsed Container - Transport Arrangement
	1003	Collapsed Container - Transport Arrangement
	1004	Collapsed Container - Transport Arrangement
	1005	Collapsed Container - Transport Arrangement
5	1006	Collapsed Container - Transport Arrangement
	1010	Chassis
	1011	Lower Section - Side Beam
	1012	Lower Section - End Beam
	1013	Fork Lift Pocket Opening
10	1014	Lower Section - Side Beam
	1015	Lower Section - End Beam
	1016	Floor Joist
	1017	Fork Lift Pockets * Compensation Plate
	1030	End Wall
15	1031	End Wall Panel - Lower Fixed
	1032	End Wall Panel - Removable
	1033	Side Wall Panel - Upper (Fixed)
	1040	Roof
	1041	Roof Skin
20	1042	Roof Skin
	1050	Rail/Column
	1051	Interleave Guide Rail/Column - Lower Section
	1052	Interleave Guide Rail/Column - Upper Section
	1053	Standard ISO Corner
25	1054	Standard ISO Corner
	1055	Interleave Guide Rail - Centre Section
	1056	Standard ISO Corner Top Opening
	1057	Standard ISO Corner Side Opening
	1060	Side Wall

	1061	Side Panel / Awning
	1062	Side Panel / Awning
	1063	Side Wall Panel Fixed - Insulated (Sandwich Panel)
	1064	Side Wall Panel Fixed - Insulated (Sandwich Panel)
5	1065	Side Wall Panel Removable - Insulated (Sandwich Panel)
	1066	Door
	1067	Side Window - Removable
	1068	Side Wall Panel Removable - Insulated (Sandwich Panel)
	1069	Doorway
10	1069A	Doorway
	1070	End Wall
	1080	Side Wall
	1081	Side Wall Panel Removable - Insulated (Sandwich Panel)
	1082	Door
15	1083	Side Wall Panel Removable - Insulated (Sandwich Panel)
	1084	Side Wall Panel Removable - Insulated (Sandwich Panel)
	1085	Doorway
	1085A	Doorway
	1091	Upper Side Section Structural Corner Member
20	1092	Upper End Section Structural Corner Member
	1093	Upper End Section Structural Corner Member
	1094	Upper Side Section Structural Corner Member
	1095	Structural Service Duct Support
	1096	Door Post Spigot
25	1097	Structural Service Duct
	1098	Structural Service Duct
	1099	Structural Service Duct
	1600	Interleave Guide Rail - Collapsed - Section
	1660	Interleave Guide Rail - Collapsed - Section

	1701	Structural Service Duct
	1702	Structural Service Duct
	1703	Door Post
	1704	Door Post
5	1705	Structural Service Duct Support
	1706	Structural Service Duct Support
	1707	Structural Service Duct Support
	1708	Structural Service Duct Support
	1709	Structural Service Duct Support
10	1710	Door Post
	1711	Door Post
	1712	Structural Service Duct Support
	1713	Structural Service Duct Support
	1714	Structural Service Duct Support
15	1715	Internal Coving
	1716	Fastener
	1720	Ceiling Panel
	1801	Internal Wall Panel - Removable
	1802	Internal Wall Panel - Removable
20	1803	Internal Wall Panel - Removable
	1804	Internal Wall Panel - Removable
	1805	Microwave
	1806	Fridge
	1807	Hot Water Tank
25	1808	Locker
	1809	Water Closet
	1810	Flexible Doors
	2101	Bedroom
	2102	Lounge

	2103	Kitchen
	2104	Bathroom
	2115	Toilet
	2300	Plumbing / Drainage
5	2400	Container
	2401	Floor base
	2402A	Roof section
	2402B	Roof section
	2403	Wall/roof sections
10	2404	Wall/roof sections
	2405	Column
	2406	Wall panel
	2407	Wall Panel
	2408	Wall Panel
15	2409	Wall Panel
	2410	Container
	2411	Floor base
	2420	Walkway/roof
	2430	Two storey building structure
20	2440	Container building structure
	2500	Container
	2501A	Floor base
	2501B	Floor base
	2502A	Roof section
25	2502B	Roof section
	2503	Wall/roof sections
	2504	Wall/roof sections
	2505	Column
	2520	Building structure

	2600	Container
	2601	Floor base
	2602A	Roof section
	2602B	Roof section
5	2603	Wall/roof sections
	2604	Wall/roof sections
	2605	Column
	2620	Container building structure
	2630	Container building structure with covered walkway
10	2701A	Floor base
	2701B	Floor base
	2701D	Floor base
	2701G	Floor base
	2702A	Roof section
15	2702B	Roof section
	2705	Columns
	2706	Centre roof panel
	2707	Centre roof panel
	2708	Extra columns
20	2709	Eave panel
	2710	Eave panel
	2801A	Floor base
	2801B	Floor base
	2801C	Floor base
25	2801D	Floor base
	2801E	Floor base
	2801F	Floor base
	2801G	Floor base
	2802A	Roof section

	2802B	Roof section
	2802C	Roof section
	2802D	Roof section
	2805	Columns
5	2806	Centre roof panel
	2807	Centre roof panel
	2808	Extra columns
	2809	Eave panels

10 Advantages

- a) A height adjustable shipping container is provided which allows a compacted building to be easily transported and expanded at the destination.
- b) Multiple containers can be located together to provide rooms which are larger than a single container.
- 15 c) Exterior panels of the container may either be packed within the container or moved from one position when compacted to another when expanded.
- d) Significant reduction in the net cost of providing accommodation.
- e) Formatted around ISO shipping container design.
- f) Able to create high rise by stacking multiple containers on one another.
- 20 g) Able to be used for different applications including, but not limited to, residential housing, storage units, sheds, garages, and buildings for emergency relief, public or commercial use.
- h) The storage space required is reduced by at least 50%, so transportation costs are also reduced by up to 50%.
- 25 i) Twice as many containers can then be delivered in the same amount of time.

Variations

It will of course be realised that while the foregoing has been given by way of illustrative example of this invention, all such and other modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit
5 of this invention as is hereinbefore described.

CLAIMS:

Claim 1: A method of manufacturing a transportable expandable shipping container for use as a building structure, wherein the transportable expandable shipping container during transportation can house within a minimum of two roofs and two floors such that when the transportable expandable shipping container is expanded for use as a building structure the transportable expandable shipping container makes up a minimum area of that of two standard shipping containers, the method includes:

- (i) providing a container base and vertical members, providing at least one first vertical wall portion adapted to be attachable to the base and adapted to extend less than the packaged height of the container, providing an upper surface secured at least in one position to an upper portion of a vertical member, and providing at least one second vertical wall portion adapted to extend towards the first vertical wall portion from the upper surface, the vertical members having a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart expandable vertical members;
- (ii) extending the vertical members to an expanded position;
- (iii) attaching a first portion of an interchangeable and relocatable side wall to an upper part of the height adjustable container during expansion; and
- (iv) attaching at least a second portion of the interchangeable and relocatable side wall to a lower part of the height adjustable container during expansion whereby the second portion of the side wall is substantially high enough to accommodate building components, fittings, furniture and fixtures below its height;

wherein when the container is in an unextended position the height of the container is at a reduced height of at least 50% to that of a standard shipping container and when the container is in the extended position the container is at a height equal to that of a habitable area or greater than the height of a standard shipping container and the erected side wall portions are coaxially aligned to form outer walls having a flat planar surface along an entire surface area of the outer wall.

Claim 2: A height adjustable transportable shipping container usable as a building structure, wherein the transportable expandable shipping container can house therein, during transportation, a minimum of two roofs and two floors such that when the transportable expandable shipping container is expanded for use as a building structure the transportable expandable shipping container makes up a minimum area of that of two standard shipping containers, the height adjustable shipping container having:

- (i) vertical corner members and at least three interchangeable and relocatable side walls which may be transported at a reduced height as a shipping container and expanded at the receiving end wherein at least some of the vertical corner members expand in length during expansion of the reduced height shipping container and the shipping container is capable of housing and transporting therein structural components, such as wall panels, floor, roof and even fittings to erect a building structure that is the equivalent in floor area to that of at least two shipping containers;
- (ii) at least one of the interchangeable and relocatable side walls is attached to an upper part of the height adjustable container during expansion, to form an upper wall and at least another one of the interchangeable and relocatable side walls is attached to a lower part of the height adjustable container during expansion, to form a lower wall, the lower wall being substantially high enough to accommodate building components, fittings, furniture and fixtures below its height: and
- (iii) the vertical members including a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart vertical members,

wherein when the container is in an unextended position the height of the container is at a reduced height of at least 50% to that of a standard shipping container and such that when the container is in the extended position the container is at a height equal to that of a habitable area or greater than the height of a standard shipping container and the erected side walls are coaxially aligned to form outer walls having a flat planar surface along an entire surface area of the outer wall.

Claim 3: The height adjustable shipping container as claimed in claim 2, wherein the vertical members are vertical rails or columns.

Claim 4: The height adjustable shipping container as claimed in any one of claims 2 to 3, wherein the height adjustable shipping container includes access points for utility services, the access points being situated at junctures between the at least one upper wall and the at least one lower wall.

Claim 5: The height adjustable shipping container as claimed in any one of claims 2 to 4, wherein at least part of a wall filling a gap between upper and lower shipping container parts is pulled into place on expansion of the container.

Claim 6: The height adjustable shipping container as claimed in any one of claims 2 to 5, wherein the interchangeable and relocatable side walls are adapted to act as bracing and shock absorbers when the shipping container is being transported

Claim 7: The height adjustable shipping container as claimed in claim 6, wherein two expanded angled top panels are placed side-by-side to form a peaked pitched roof.

Claim 8: The height adjustable shipping container as claimed in any one of claims 2 to 7, wherein at least one of the two floors that can be housed in the shipping container is adapted to receive a pourable settable material and includes elements acting as reinforcement for the settable material.

Claim 9: The height adjustable shipping container as claimed in claim 8, wherein the reinforcement elements extend through two adjacent expanded shipping container floors.

Claim 10: The height adjustable shipping container as claimed in any one of claims 2 to 9, wherein the shipping container vertical corner members include telescoping portions in

which any engagement features in the corner rail top are substantially repeated in a top of each telescoping portion.

Claim 11: The height adjustable shipping container as claimed in any one of claims 2 to 10, wherein when in the expanded form the vertical corner members remain capable of supporting vertical loads.

Claim 12: The height adjustable shipping container as claimed in any one of claims 2 to 11, wherein the interchangeable and relocatable side walls can be relocated to an outer shell of the erected container to create a combination of external walls, windows and door openings, whereby the side walls are interchangeable with windows and doors to create a number of different predetermined formats.

Claim 13: The height adjustable shipping container as claimed in claim 8, wherein each of the two floors include spaced apart openings adapted to receive the tines of a fork lift to allow the unerected shipping container to be easily transported, wherein the spaced apart openings are adapted for use as service ducts when the shipping container is erected.

Claim 14: The height adjustable shipping container as claimed in any one of claims 2 to 13, wherein the vertical corner members have an open cross section.

Claim 15: The height adjustable shipping container as claimed in any one of claims 2 to 14, wherein the lower wall is substantially 0.9 metres high and the upper wall is substantially 0.3 metres high.

Claim 16: The height adjustable shipping container as claimed in any one of claims 2 to 15, wherein a top surface of the height adjustable shipping container is angled with respect to a plane of the two floors.

Claim 17: The height adjustable shipping container as claimed in claim 14, wherein the vertical corner members have a substantially 'L'-shaped cross section.

Claim 18: A transportation system for the transportation, packaging and erection of a transportable height adjustable shipping container usable as a building, the transportable expandable shipping container during a transportation mode can house therein a minimum of two roofs and two floors such that when the transportable expandable shipping container is in a building mode for use as a building structure the transportable expandable shipping container takes up a minimum area of that of two standard shipping containers, the transportation system including an external building shell that is transformable between the transportation mode and the building mode, when in the transportation mode the external building shell falls within same floor dimensions and floor area of a shipping container format, the external building shell being height adjustable such that the external shell is adapted to be transformed from the transport mode to the building mode by adjusting the height of the external building shell to a desired height, when in the transportation mode the internal space within the external building shell includes structural components, such as building components, wall panels, floor, roof fittings, furniture and fixtures required to erect and fit out a building structure that is the equivalent in floor area to that of at least two shipping container formats; the external building shell including:

- a) vertical corner members and at least three interchangeable and relocatable side walls which are transported at a reduced height to that of a shipping container and expanded at the receiving end wherein at least some of the vertical corner members expand in length during expansion of the reduced height shipping container;
- b) at least one of the interchangeable and relocatable side walls is attached to an upper part of the height adjustable container during expansion to form an upper wall and at least one of the interchangeable and relocatable side walls is attached to the lower part of the height adjustable container during expansion to form a lower wall, the lower wall being substantially high enough to accommodate the structural components, such as building components, wall panels, floor, roof fittings, furniture and fixtures, below its height when in the transportation mode; and

- c) the expandable vertical members having a horizontally extending channel to support a portion of a load bearing beam adapted to extend between two spaced apart expandable vertical members,

wherein the transportation system when in the transportation mode the external building shell is at a reduced height of at least 50% to that of a standard shipping container and such that when in the building mode the external building shell is at a height equal to that of a habitable area or greater than the height of a standard shipping container and the erected interchangeable and relocatable side walls are coaxially aligned to form outer walls having a flat planar surface along an entire surface area of the outer wall.

Claim 19: The transportation system as claimed in claim 18, wherein the lower wall is substantially 0.9 metres high and the upper wall is substantially 0.3 metres high.

Claim 20: The height adjustable shipping container as claimed in claim 18 or claim 19, wherein the vertical corner members have an open cross section.

Claim 21: The transportation system as claimed in claim 20, wherein the vertical corner members have a substantially 'L'-shaped cross section.

Claim 22: The method of manufacturing a transportable expandable shipping container for use as a building structure as claimed in claim 1, wherein the method includes a further step of relocating the elements forming the shipping container walls during transport elsewhere to and/or within the container after expansion.

Claim 23: The height adjustable transportable shipping container usable as a building structure as claimed in claim 2, wherein the elements forming the shipping container walls during transport are adapted to be relocated elsewhere within the container after expansion.