Claims

WHAT IS CLAIMED IS:

1. A method of modular building construction comprising:

(a) providing a first volumetric construction module comprising a frame, the frame comprising a first segment;

(b) defining a volume of a composite segment incorporating at least a portion of the first segment within the volume; and

(c) filling the volume with a curable material to cast the composite segment.

2. A method according to claim 1 further comprising prior to step (b), step (a)(i) comprising providing a structure adjacent the first volumetric construction module, the adjacent structure comprising a second segment, and wherein step (b) comprises incorporating at least a portion of each of the first segment and the second segment within the volume.

3. A method according to claim 2, wherein step (b) comprises defining a boundary of the volume with temporary formwork.

4. A method according to claim 2, wherein step (b) comprises defining at least a portion of the boundary of the volume with the first and second segments.

5. A method according to any one of claims 2 to 4, wherein the adjacent structure comprises a second volumetric construction module comprising a frame including the second segment.

6. A method according to claim 5, comprising prior to step (b), step (a)(ii) comprising augmenting structural capacity of the composite segment.

7. A method according to claim 6, wherein step (a)(ii) comprises coupling the first segment and/or the second segment to a plurality of shear connectors extending into the volume.

8. A method according to claim 7 wherein step (a)(ii) further comprises coupling a column reinforcement member to the plurality of shear connectors.

9. A method according to claim 6 wherein step (a)(ii) comprises providing a column closure member opposite to the first segment and/or the second segment, the column closure member defining a portion of the boundary of the volume.

10. A method according to claim 9 wherein the column closure member is coupled to a plurality of shear connectors extending into the volume.

11. A method according to claim 6 wherein step (a)(ii) comprises providing a plurality of first and second reinforcement elements, the first and second reinforcement elements extending in transverse planes with respect to each other.

12. A method according to claim 11, wherein the first reinforcement elements comprise rebar rods and the second reinforcement elements comprise rebar stirrups.

13. A method according to claim 7 wherein step (a)(ii) further comprises providing a plurality of first and second reinforcement elements, wherein the second reinforcement elements engage the shear connectors.

14. A method according to claim 13, wherein the first reinforcement elements comprise rebar rods and the second reinforcement elements comprise rebar stirrups.

15. A method according to any one of claims 5 to 14 wherein each of the first and second volumetric construction modules has an opening defined in its side that faces the other module, and wherein the volume comprises a space between the modules adjacent the openings.

16. A method according to any one of claims 5 to 15 wherein the volume comprises a space between adjacent corners of the frame of the at least one of the first and second volumetric construction modules.

17. A method according to any one of claims 5 to 15 wherein the volume comprises a space adjacent an edge of the frame of at least one of the first and second volumetric construction modules.

18. A method according to any one of claims 5 to 17 wherein the first and second volumetric construction modules are provided in laterally adjacent relation.

19. A method according to claim 18 wherein providing the first and second volumetric construction modules in laterally adjacent relation comprises providing the modules such that a side of one module is adjacent a side of the other module, or such that an end of one module is adjacent a side of the other module, or such that an end of one module is adjacent an end of the other module.

20. A method according to any one of claims 5 to 19 wherein the frame of each of the first and second volumetric construction module comprises a plurality of vertical posts, wherein the volume comprises a space between opposed posts of the modules.

21. A method according to any one of claims 5 to 19 wherein the frame of each of the first and second volumetric construction module comprises a horizontal rail, wherein the volume comprises a space between opposed rails of the modules.

22. A method according to any one of claims 5 to 19 wherein each of the first and second volumetric construction module comprises a panel section fastened to the frame, wherein the volume comprises a space between opposed panel sections of the modules.

23. A method according to any one of claims 5 to 19 comprising bridging adjacent upper portions of the frames with a structural member to provide a bottom boundary of a slab volume.

24. A method according to claim 23 wherein the structural member comprises one or more upwardly extending shear connectors.

25. A method according to claim 24 wherein the shear connectors extend past the top of the frames.

26. A method according to claim 23 wherein a plurality of rebar rods and rebar stirrups are provided in the slab volume.

27. A method according to any one of claims 23 to 26 wherein the structural member comprises a hot or cold rolled steel section.

28. A method according to claim 23 to 27 wherein a boundary of the slab volume is partially defined by a spacer installed above the first volumetric construction module and/or the second volumetric construction module.

29. A method according to claim 28 wherein at least the top corners of the frame of each of the first and second volumetric construction modules comprise corner fittings having upper orifices, wherein the spacer comprises at least one downward projection, and wherein installing the at least one spacer comprises mating the at least one downward projection with one of the upper orifices.

30. A method according to any one of claims 23 to 29 comprising introducing a curable material to the slab volume.

31. A method according to any one of 28 to 30 comprising providing an upper volumetric construction module above each of the first and second volumetric construction modules, each of the upper volumetric construction modules comprising a frame.

32. A method according to claim 31 wherein at least bottom corners of the frame of each upper module comprise corner fittings having lower orifices, wherein the spacer comprises at least one upward projection, and wherein providing the upper volumetric modules above the volumetric construction modules comprises mating the at least one upward projection with one of the lower orifices.

33. A method according to any one of claims 6 to 32 wherein each of the frames of the first and second volumetric construction modules comprises a rectangular parallelpiped frame.

34. A method according to claim 33 wherein the rectangular parallelpiped frame comprises at least a part of a frame of an intermodal shipping container.

35. A method according to any one of claims 6 to 34 wherein the curable material comprises concrete.

36. A method of modular building construction comprising:

(a) providing first and second volumetric construction modules in lateral relation, each module comprising a frame, at least one of the frames comprising a first segment;

(b) providing a panel expansion member spanning opposing top rails of the frames and a floor frame between opposing bottom rails of the frame, the space between the panel expansion member and the floor frame defining an expansion space, at least one of the panel expansion member and the floor frame comprising a second segment;

(c) defining a volume of a composite segment incorporating at least a portion of each of the first segment and the second segment within the volume; and

(d) filling the volume with a curable material to cast the composite segment.

37. A method according to claim 36, wherein step (c) comprises defining a boundary of the volume with temporary formwork.

38. A method according to claim 36, wherein in step (c) comprises defining at least a portion of the boundary of the volume with the first and second segments.

39. A method according to any one of claims 36 to 38, comprising prior to step (d) a step (c)(i) comprising augmenting the structural capacity of the composite segment.

40. A method according to claim 39, wherein step (c)(i) comprises coupling the first segment and/or the second segment to a plurality of shear connectors extending into the volume.

41. A method according to claim 39, wherein step (c)(i) comprises providing a plurality of first and second reinforcement elements, the first and second reinforcement elements extending in transverse planes with respect to each other.

42. A method according to claim 41, wherein the first reinforcement elements comprise rebar rods and the second reinforcement elements comprise rebar stirrups.

43. A method according to any one of claims 36 to 42 wherein each volumetric construction module has an opening defined in its side that faces the expansion space, and wherein the volumes comprises a space between the modules and the expansion space adjacent the openings.

44. A method according to any one of claims 36 to 42 wherein the volume comprises a space between adjacent corners of the frame of the at least one of the first and second volumetric construction modules.

45. A method according to any one of claims 36 to 44 wherein the volume comprises a space adjacent an edge of the frame of at least one of the first and second volumetric construction modules.

46. A method according to any one of claims 36 to 44 wherein a side of the first volumetric construction module is aligned with the side of the second volumetric construction module, with the expansion space located therebetween.

47. A method according to any one of claims 36 to 44 wherein a side of the first volumetric construction module is aligned with an end of the second volumetric construction module, with the expansion space located therebetween.

48. A method according to any one of claims 36 to 44 wherein an end of the first volumetric construction module is aligned with an end of the second volumetric construction module, with the expansion space located therebetween.

49. A method according to any one of claims 36 to 48 wherein the panel expansion member partially defines a bottom boundary of a slab volume above the modules and the expansion space.

50. A method according to claim 49 wherein the panel expansion member comprises a structural member at two side regions of the panel expansion member wherein spanning opposing top rails comprises resting at least a portion of the structural member on the top rails or on opposing sides of the modules

51. A method according to claim 50 wherein the structural member comprises a hot or cold rolled steel section.

52. A method according to claim 50 or 51 wherein the structural member is provided with upwardly projecting shear connectors.

53. A method according to any one of claims 36 to 52 wherein each of the frames of the first and second volumetric construction modules comprises a rectangular parallelpiped frame.

54. A method according to claim 53 wherein the rectangular parallelpiped frame comprises at least a part of a frame of an intermodal shipping container.

55. A method according to claim 36 to 54 wherein the panel expansion member comprises at least a part of a panel of an intermodal shipping container.

56. A method according to any one of claims 36 to 55 wherein the floor frame comprises at least a part of a floor frame of an intermodal shipping container.

57. A method according to any one of claims 36 to 56 wherein the curable material comprises concrete.

58. A method of modular building construction comprising:

(a) providing a first volumetric construction module comprising a frame, the frame comprising a first segment;

(b) providing a partially constructed building comprising a frame comprising a second segment;

(c) defining a volume of a composite segment incorporating at least a portion of each of the first segment and the second segment; and

(d) filling the volume with a curable material to cast the composite segment.

59. A method according to claim 58, wherein step (c) comprises defining a boundary of the volume with temporary formwork.

60. A method according to claim 58, wherein step (c) comprises defining at least a portion of the boundary of the volume with the first and second segments.

61. A method according to any one of claims 58 to 60, comprising prior to step (d) a step (c)(i) comprising augmenting the structural capacity of the composite segment.

62. A method according to claim 61, wherein step (c)(i) comprises coupling the first segment and/or the second segment to a plurality of shear connectors extending into the volume.

63. A method according to claim 61 wherein step (c)(i) further comprises providing a plurality of first and second reinforcement elements, the first and second reinforcement elements extending in transverse planes with respect to each other.

64. A method according to claim 63, wherein the first reinforcement elements comprise rebar rods and the second reinforcement elements comprise rebar stirrups.

65. A modular building diaphragm comprising:

roof panels of first and second volumetric construction modules in laterally adjacent relation;

floor frames of third and fourth volumetric construction modules in laterally adjacent relation, the third and fourth modules above the first and second modules, respectively;

a beam soffit member connected between upper portions of the first and second modules and having one or more shear connectors extending upwardly between the third and fourth modules; and

a continuous body of concrete in contact with at least a portion of each of the roof panels of the first and second modules, the laterally adjacent portions of the third and fourth modules, and the beam soffit member, the concrete bonded in composite action with the one or more shear connectors of the beam soffit member.

66. A modular building diaphragm comprising:

roof panels of first and second volumetric construction modules in laterally adjacent relation;

floor frames of third and fourth volumetric construction modules in laterally adjacent relation, the third and fourth modules above the first and second modules and, respectively, bottom rails of the third and fourth modules rigidly connected by at least one shear connector;

a structural member connected between upper portions of the first and second modules; and

at least one first reinforcing element extending in a direction parallel to a long axis of the bottom rails;

a plurality of second reinforcing elements oriented in a plane transverse to the long axis of the bottom rails, each of the second reinforcing elements coupling the at least one shear connector to the at least one first reinforcing element; and

a continuous body of concrete in contact with at least a portion of each of the roof panels of the first and second modules, the laterally adjacent portions of the third and fourth modules, the at least one first reinforcing element, the plurality of second reinforcing elements, and the structural member, the concrete bonded in composite action with the one or more shear connectors.

67. A column in a modular building, the column comprising:

a first panel section of a first volumetric construction module;

a second panel section of a second volumetric construction module, the second panel section parallel to and spaced apart from the first panel section;

at least one shear connector extending into a volume between the first panel section and the second panel section and attached to at least one of the first panel section and the second panel section;

at least one column closure member closing lateral sides of the volume between the first panel section and the second panel section; and

concrete in the volume bonded in composite action with the at least one shear connector.

68. The column of claim 67 wherein the first module has an opening defined in part by an inward edge of the first panel section, wherein the second module has an opening defined in part by an inward edge of the second panel section, and wherein the at least one column closure member borders the openings in the first and second modules.

69. The column of claim 68 comprising at least one shear connector attached to the at least more column closure member, wherein the concrete is bonded in composite action with the at least one shear connector attached to the at least one column closure member.

70. A column in a modular building, the column comprising:

a first corner post section of a first volumetric construction module;

a first vertically extending reinforcement member;

a first plurality of shear connectors rigidly connecting the first corner post section to the first vertically extending reinforcement member;

a volume defined by temporary formwork, the volume surrounding and including the first corner post section, the first vertically extending reinforcement member, and the first plurality of shear connectors; and

concrete in the volume encasing and bonding in composite action the first corner post section, the first vertically extending reinforcement member, and the first plurality of shear connectors.

71. The column of claim 70 further comprising:

a second corner post section of a second volumetric construction module adjacent the first corner post section;

a second vertically extending reinforcement member;

a second plurality of shear connectors rigidly connecting the second corner post section to the second vertically extending reinforcement member;

wherein the volume additionally surrounds and includes the second corner post section, the second vertically extending reinforcement member, and the second plurality of shear connectors; and

wherein the concrete in the volume additionally encases and bonds in composite action the second corner post section, the second vertically extending reinforcement member, and the second plurality of shear connectors.

72. A column in a modular building, the column comprising:

a first corner post section of a first volumetric construction module;

a second corner post section of a second volumetric construction module adjacent the first corner post section;

a first plurality of shear connectors rigidly connecting the first corner post section to the second corner post section;

a volume defined by temporary formwork, the volume surrounding and including the first corner post section, the second corner post section, and the first plurality of shear connectors; and

concrete in the volume encasing and bonding in composite action the first corner post section, the second corner post section, and the first plurality of shear connectors.

73. The column of claim 72, further comprising

a third corner post section of a third volumetric construction module adjacent the first or second corner post section;

a fourth corner post section of a forth volumetric construction module adjacent the third corner post section;

a second plurality of shear connectors rigidly connecting the third corner post section to the fourth corner post section;

wherein the volume additionally surrounds and includes the third corner post section, the fourth corner post section, and the second plurality of shear connectors; and

wherein the concrete in the volume additionally encases and bonds in composite action the third corner post section, the fourth corner post section, and the second plurality of shear connectors.

74. A column in a modular building, the column comprising:

a first corner post section of a first volumetric construction module;

at least one first reinforcing element extending in a direction parallel to a long axis of the first corner post section;

at plurality of second reinforcing elements oriented in a plane transverse to the long axis of the first corner post section, each of the second reinforcing elements surrounding both the first corner post section and the at least one first reinforcing element;

a volume defined by temporary formwork, the volume surrounding and including the first corner post section, the at least one first reinforcing element and the plurality of second reinforcing elements; and

concrete in the volume encasing and bonding in composite action the first corner post section, the at least one first reinforcing element and the plurality of second reinforcing elements.

75. A column according to claim 74, comprising a second corner post section adjacent the first corner post section, wherein each of the second reinforcing elements surround the second corner post section, wherein the volume surrounds and includes the second corner post section, and wherein the concrete in the volume encases and bonds in composite action the first corner post section, the second corner post section, the at least one first reinforcing element and the plurality of second reinforcing elements.

76. A column according to claim 74 or 75, wherein the at least one first reinforcing element comprises a rebar rod, and the plurality of second reinforcing elements comprise rebar stirrups.

77. A beam in a modular building, the beam comprising:

a first horizontal rail of a first volumetric construction module;

a second horizontal rail of a second volumetric construction module, the second horizontal rail parallel to and spaced apart from the first rail;

at least one shear connector extending into a volume between the first rail and the second rail and attached to at least one of the first rail and the second rail;

a beam soffit member below the first rail and the second rail, the beam soffit member having one or more shear connectors extending into the volume between the first rail and the second rail; and

concrete in the volume between the first rail and the second rail, the concrete bonded in composite action with the at least one shear connector attached to at least one of the first rail and the second rail and with the one or more shear connectors of the beam soffit member.

78. The beam of claim 77 wherein the first module has an opening defined above the first rail, wherein the second module has an opening defined above the second rail, and wherein an upper face of the concrete borders the openings in the first and second modules.

79. A beam in a modular building, the beam comprising:

a first horizontal rail of a first volumetric construction module;

a second horizontal rail of a second volumetric construction module, the second horizontal rail parallel to and spaced apart from the first rail;

at least one shear connector extending between the first rail and the second rail and attached to at least one of the first rail and the second rail;

at least one first reinforcing element extending in a direction parallel to a long axis of the first and second horizontal rail;

a plurality of second reinforcing elements oriented in a plane transverse to the long axis of the first and second horizontal rail, each of the second reinforcing elements coupling the at least one shear connector to the at least one first reinforcing element; and

a structural member below the first rail, the second rail, the at least one first reinforcing element, and the plurality of second reinforcing elements; and

concrete in a volume defined between the first rail and the second rail, the concrete bonded in composite action with the at least one shear connector, the at least one first reinforcing element, and the plurality of second reinforcing elements.

80. A beam according to claim 79, wherein the structural member comprises a hot or cold rolled steel section.

81. A beam according to claim 79 or 80, wherein the plurality of second reinforcing elements are substantially U-shaped, wherein end regions of the U-shape engage the at least one shear connector, and a middle region of the U-shape engages the at least one first reinforcing element.

82. A beam according to any one of claims 79 to 81, wherein the at least one first reinforcing element comprises a rebar rod, and the plurality of second reinforcing elements comprise rebar stirrups.

83. A shear wall in a modular building, the shear wall comprising:

a shear wall panel;

at least a portion of one end or side of a volumetric construction module;

at least one connector rigidly fixed to each of the shear wall panel and the portion of the one end or side, and wherein the at least one connector extends from the shear wall panel to the portion of the one end or side;

concrete in a volume defined between the shear wall panel and the portion of the one end or side, the volume incorporating the at least one connector in composite action.

84. A shear wall according to claim 83 wherein the shear wall panel comprises repurposed intermodal shipping container wall material.

85. A volumetric construction module comprising:

a frame having opposed ends and opposed sides extending between the ends; and

one or more shear connectors projecting outwardly from the frame.

86. A volumetric construction module according to claim 85 wherein the frame comprises at least part of a rectangular parallelepiped frame of an intermodal shipping container.

87. A volumetric construction module according to claim 85 or 86 wherein the one or more shear connectors extend between adjacent corners of the frame.

88. A volumetric construction module according to any one of claims 85 to 87 wherein the one or more shear connectors comprises an array of stud-type shear connectors.

89. A volumetric construction module according to any one of claims 85 to 88 wherein the one or more shear connectors comprises at least one strip-type shear connector.

90. A volumetric construction module according to any one of claims 85 to 89 wherein the one or more shear connectors is located adjacent an edge of the frame.

91. A volumetric construction module according to claim 90 wherein the edge comprises an edge between one of the ends of the frame and one of the sides of the frame.

92. A volumetric construction module according to claim 90 or 91 wherein the frame comprises a plurality of vertical posts, and wherein at least one of the one or more shear connectors is attached to one of the posts.

93. A volumetric construction module according to any one of claims 90 to 92 comprising a panel section coupled to the frame, and wherein at least one of the one or more shear connectors is attached to the panel section.

94. A volumetric construction module according to claim 90 wherein the edge comprises an edge between a bottom of the frame and one of the sides of the frame.

95. A volumetric construction module according to claim 90 wherein the edge is located along the top of one of the ends.

96. A volumetric construction module according to claim 94 or 95 wherein the frame comprises a horizontal rail, and wherein at least one of the one or more shear connectors is attached the rail.

97. A volumetric construction module according to any one of claims 85 to 96 wherein the frame has an opening in one of its sides, and wherein at least one of the shear connectors extends along an edge of the opening.

98. A method for making a volumetric construction module, the method comprising:

providing an intermodal shipping container;

installing one or more shear connectors on the outside of the container.

99. The method of claim 98 comprising removing a portion of a side panel of the container to define an opening in a side of the container.

100. The method of claim 99 comprising detachably fastening the removed portion of the side panel to the container.

101. The method of any one of claims 99 to 100 wherein installing the one or more shear connectors comprises:

attaching the one or more shear connectors to the removed portion of the side panel; and

laminating the removed portion of the side panel to a remaining portion of the side panel of the container.

102. The method of any one of claims 98 to 101 wherein installing the one or more shear connectors comprises installing one or more shear connectors between adjacent corners of the container.

103. The method of any one of claims 98 to 102 wherein installing the one or more shear connectors comprises installing an array of stud-type shear connectors.

104. The method of any one of claims 98 to 103 wherein installing the one or more shear connectors comprises installing at least one strip-type shear connector.

105. The method of any one of claims 98 to 104 wherein installing the one or more shear connectors comprises installing the one or more shear connectors adjacent to an edge of the container.

106. The method of claim 105 wherein the edge comprises an edge between an end of the container and a side of the container.

107. The method of claim 106 wherein installing the one or more shear connectors comprises attaching at least one of the one or more shear connectors to a post of the container.

108. The method of claim 106 or 107 wherein installing the one or more shear connectors comprises attaching at least one of the one or more shear connectors to a panel of the container.

109. The method of claim 108 wherein the edge comprises an edge between a bottom of the container and a side of the container.

110. The method of claim 108 wherein the edge comprises an edge between a top of the container and an end of the container.

111. The method of claim 109 or 110 wherein installing the one or more shear connectors comprises attaching at least one of the one or more shear connectors to a horizontal rail of the container.

112. The method of any one of claims 98 to 111 wherein installing the one or more shear connectors comprises welding at least one of the one or more shear connectors to the container.

113. The method of any one of claims 98 to 112 wherein installing the one or more shear connectors comprises adhesively bonding at least one of the one or more shear connectors to the container.

114. The method of any one of claims 98 to 113 wherein installing the one or more shear connectors comprises mechanically coupling at least one of the one or more shear connectors to the container.

115. A building comprising:

two volumetric construction modules in adjacent relation, each module comprising:

a frame having opposed ends and opposed sides extending between the ends, and

one or more first shear connectors coupled to the frame and extending toward the other module;

at least one first closure member closing lateral sides of a first volume between the modules that includes the one or more first shear connectors; and

concrete occupying the first volume.

116. The building of claim 115 wherein each module has an opening defined in its side that faces the other module, and wherein the first volume is adjacent the openings.

117. The building of claim 116 wherein each of the modules comprises one or more second shear connectors, and wherein the building comprises:

at least one second first closure member closing lateral sides of a second volume between the modules that includes the one or more second shear connectors; and

concrete occupying the second volume,

wherein the second volume is spaced apart from the first volume and adjacent the openings in the modules.

118. The building of claim 115 wherein the frame of each module comprises at least part of a rectangular parallelpiped frame of an intermodal shipping container.

119. A building comprising:

a first volumetric construction module comprising a frame, the frame comprising a first segment;

a volume of a composite segment incorporating at least a portion of the first segment within the volume;

a structure adjacent the first volumetric construction module, the adjacent structure comprising a second segment, wherein the volume integrates at least a portion of each of the first segment and the second segment; and

concrete occupying the volume.

120. A building according to claim 119, wherein the adjacent structure comprises a second volumetric construction module.

121. A building according to claim 119, wherein the adjacent structure comprises an expansion space.

122. A building according to claim 119, wherein the adjacent structure comprises a partially constructed building.

123. A building according to any one of claims 119 to 122, wherein the volume contains at least a portion of the first and second segments, wherein boundaries of the volume are formed by temporary formwork.

124. A building according to any one of claims 119 to 123 further comprising a base isolation system.

125. A method according to claim 3 wherein the adjacent structure comprises a second volumetric construction module comprising a frame including the second segment.

126. A method according to claim 125 wherein the adjacent structure comprises a second volumetric construction module comprising a frame including the second segment.

127. A method according to any one of claims 1-3, 125 and 126 wherein the curable material comprises a high strength curable material.

128. A method according to claim 127 wherein the curable material comprises carbon fibre reinforced polymer or high strength concrete.

129. A method according to claim 6, wherein step (a)(ii) comprises coupling the first segment and the second segment by wrapping the segments with fibre reinforced polymer wrap.

CLAIMS:

1. A method of modular building construction comprising:
(a) providing a first volumetric construction module comprising a frame, the frame comprising a first segment;
(b) defining a volume of a composite segment incorporating at least a portion of the first segment within the volume; and
(c) filling the volume with a curable material to cast the composite segment.

2. A method according to claim 1 further comprising prior to step (b), step (a)(i) comprising providing a structure adjacent the first volumetric construction module, the adjacent structure comprising a second segment, and wherein step (b) comprises incorporating at least a portion of each of the first segment and the second segment within the volume.

3. A method according to claim 2, wherein step (b) comprises defining a boundary of the volume with temporary formwork.

4. A method according to claim 2, wherein step (b) comprises defining at least a portion of the boundary of the volume with the first and second segments.

5. A method according to any one of claims 2 to 4, wherein the adjacent structure comprises a second volumetric construction module comprising a frame including the second segment.

6. A method according to claim 5, comprising prior to step (b), step (a)(ii) comprising augmenting structural capacity of the composite segment.

7. A method according to claim 6, wherein step (a)(ii) comprises coupling the first segment and/or the second segment to a plurality of shear connectors extending into the volume.

8. A method according to claim 7 wherein step (a)(ii) further comprises coupling a column reinforcement member to the plurality of shear connectors.

9. A method according to claim 6 wherein step (a}(ii) comprises providing a column closure member opposite to the first segment and/or the second segment, the column closure member defining a portion of the boundary of the volume.

10. A method according to claim 9 wherein the column closure member is coupled to a plurality of shear connectors extending into the volume.

11. A method according to claim 6 wherein step (a)(ii) comprises providing a plurality of first and second reinforcement elements, the first and second reinforcement elements extending in transverse plains with respect to each other.

12. A method according to any one of claims 5 to 11 wherein the frame of each of the first and second volumetric construction module comprises a plurality of vertical posts, wherein the volume comprises a space between opposed posts of the modules.

13. A method according to any one of claims 5 to 11 wherein the frame of each of the first and second volumetric construction module comprises a horizontal rail, wherein the volume comprises a space between opposed rails of the modules.

14. A method according to any one of claims 5 to 11 wherein each of the first and second volumetric construction module comprises a panel section fastened to the frame, wherein the volume comprises a space between opposed panel sections of the modules.

15. A method according to any one of claims 5 to 11 comprising bridging adjacent upper portions of the frames with a structural member to provide a bottom boundary of a slab volume.

16. A method according to claim 15 comprising introducing a curable material to the slab volume.

17. A method of modular building construction comprising:
(a) providing first and second volumetric construction modules in lateral relation, each module comprising a frame, at least one of the frames comprising a first segment;
(b) providing a panel expansion member spanning opposing top rails of the frames and a floor frame between opposing bottom rails of the frame, the space between the panel expansion member and the floor frame defining an expansion space, at least one of the panel expansion member and the floor frame comprising a second segment;
(c) defining a volume of a composite segment incorporating at least a portion of each of the first segment and the second segment within the volume;
(d) filling the volume with a curable material to cast the composite segment.

18. A method according to claim 17, wherein step (c) comprises defining a boundary of the volume with temporary formwork.

19. A method according to claim 17, wherein in step (c) comprises defining at least a portion of the boundary of the volume with the first and second segments.

20. A method according to any one of claims 17 to 19, comprising prior to step (d) a step (c)(i) comprising augmenting the structural capacity of the composite segment.

21. A method according to claim 20, wherein step (c)(i) comprises coupling the first segment and/or the second segment to a plurality of shear connectors extending into the volume.

22. A method according to claim 20, wherein step (c)(i)comprises providing a plurality of first and second reinforcement elements, the first and second reinforcement elements extending in transverse planes with respect to each other.

23. A method of modular building construction comprising:
(a) providing a first volumetric construction module comprising a frame, the frame comprising a first segment;
(b) providing a partially constructed building comprising a frame comprising a second segment;
(c) defining a volume of a composite segment incorporating at least a portion of each of the first segment and the second segment; and
(d) filling the volume with a curable material to cast the composite segment.

24. A method according to claim 23, wherein step (c) comprises defining a boundary of the volume with temporary formwork.

25. A method according to claim 23, wherein step (c) comprises defining at least a portion of the boundary of the volume with the first and second segments.

26. A method according to any one of claims 23 to 25, comprising prior to step (d) a step (c)(i) comprising augmenting the structural capacity of the composite segment.

27. A method according to claim 26, wherein step (c)(i) comprises coupling the first segment and/or the second segment to a plurality of shear connectors extending into the volume.

28. A method according to claim 26 wherein step (c)(i) further comprises providing a plurality of first and second reinforcement elements, the first and second reinforcement elements extending in transverse planes with respect to each other.

29. A building comprising:

a first volumetric construction module comprising a frame, the frame comprising a first segment;

a volume of a composite segment incorporating at least a portion of the first segment within the volume;

a structure adjacent the first volumetric construction module, the adjacent structure comprising a second segment, wherein the volume integrates at least a portion of each of the first segment and the second segment; and

concrete occupying the volume.

30. A building according to claim 29,wherein the adjacent structure comprises a second volumetric construction module.

31. A building according to claim 29,wherein the adjacent structure comprises an expansion space.

32. A building according to claim 29,wherein the adjacent structure comprises a partially constructed building.

33. A building according to any one of claims 29-32, wherein the volume contains at least a portion of the first and second segments, wherein boundaries of the volume are formed by temporary formwork.