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FORMWORK ELEMENT

Related Application

- 5 The application claims priority from Australian Patent Application Number AU2013206540, the content of which is incorporated in entirety by reference.

Field of the Invention

- 10 The present invention relates to a formwork element, a composite structure including a concrete slab and the formwork element, and to a construction assembly with a load transfer member attached to the formwork element.

Background of the Invention

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Formwork elements are typically used in in-situ, or precast, for casting of concrete structures for construction of a building. In the casting process, a continuous perimeter is first formed by positioning a plurality of profiled steel sheets positioned in an edge to edge arrangement as required to form a base, with a plurality of edge-formwork elements that define the outer
20 edges of the concrete structure. Subsequently, wet concrete is poured within the continuous perimeter forming the concrete structure.

In existing arrangements, the profiled steel sheets and edge formwork elements may contribute to the mechanical performance of the concrete structure by acting in composite action with the
25 concrete structure. In other arrangements, the profiled steel sheets and edge formwork elements do not make a contribution to the mechanical performance but act as lost formwork only.

Typically, concrete reinforcement members such as steel bars may be positioned within the
30 continuous perimeter prior to pouring of the wet concrete, such that the concrete reinforcement members are cast into the concrete structure during the casting process. The concrete

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reinforcement members may contribute to the mechanical performance of the concrete structure, by acting in composite action with the concrete structure.

Often, external systems such as curtain walls, green walls, masonry walls, secondary steel frames, cladding systems, temporary protection, balustrades, or signage, are required to be fixed to the concrete structure after the casting process. In the example of a concrete floor slab, fixing is conventionally achieved by bolting attachments to a top horizontal face or a vertical edge of the floor slab. Although this can be achieved by drilling into the floor slab and subsequently introducing suitable fixing members such as mechanical or chemical concrete anchors, this arrangement is typically time consuming. The process of drilling can be complicated by the presence of the concrete reinforcement members in the concrete structure, since typical concrete drills are usually unsuitable for use in penetrating the concrete reinforcement members.

Alternatively, individual and separate channels adapted for fixing of the external systems can be cast into in the concrete structure during the casting process. In the example of the concrete floor slab, this is routinely done on the top horizontal face of the floor slab, since the individual channels can be easily positioned without any clash with the continuous perimeter.

In circumstances wherein fixing is required at the vertical edge of the floor slab, one or more steps of, for example, on-site or off-site manipulation are typically required, such that the individual channels are integrated with the edge-formwork element prior to pouring of the wet concrete. This results in a labour intensive construction process, especially since the edge-formwork element is often required to be stripped off the floor slab after the casting process, in order for the individual channels to be revealed.

There have been various attempts to overcome this by providing an edge-formwork element with an externally opening channel being prefixed on the edge-formwork element. This includes edge-formwork elements in the form of an L-shaped assembly, formed by welding or bolting a plurality of plates to the channel. Although the resulting element simplifies the construction process, the element is typically costly due to a labour intensive manufacturing

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process.

In addition to the above, in use, the load capacity of the mechanical or chemical concrete anchors, and the individual channels, are typically limited by the pull-out capacity of the concrete structure. As such, in use of the mechanical or chemical concrete anchors, and the individual channels, various limitations such as anchor spacing, edge distance and concrete thickness have to be adhered to, such that the concrete structure is adequate in resisting the associated forces. Often, this renders the mechanical or chemical concrete anchors, and the individual channels unsuitable for use near the edges of the concrete structure, or in instances where the concrete structure is not thick enough. In use, the mechanical or chemical concrete anchors, and the individual channels may also clash with the profiled steel sheets.

The present invention seeks to provide a formwork element which will overcome or substantially ameliorate at least some of the deficiencies of the prior art, or to at least provide an alternative.

It is to be understood that, if any prior art is referred to herein, such reference does not constitute an admission that the information forms part of the common general knowledge in the art, in Australia or any other country.

Summary of the Invention

In accordance with the invention, there is provided a composite structure formed of a concrete slab and an integrated formwork element, wherein:

the formwork element includes a side wall, against which concrete is poured to define a side of the slab, and a lateral flange that covers a top or bottom peripheral edge of the slab; wherein

the lateral flange has a grip that extends into a main body of the slab in a vertical direction, to form a space between the grip and the side wall, which is substantially filled with concrete such that the concrete locks into the space and structurally integrates the element with the

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concrete slab; and wherein

the lateral flange has a groove formed in an external face of the flange, opposite the slab, to serve as an anchor site for a load transfer member attached externally of the composite
5 structure by being fitted to the formwork element.

Preferably, the grip is formed as an indent projecting inwardly from the associated top or bottom peripheral edge of the slab.

10 Preferably, the groove is formed at a reverse side of the indent.

Preferably, the indent includes an angled first section that extends into the body of the slab and a return section that acts as a barrier to restrict concrete being poured over the indent and into the groove.

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Preferably, the side wall includes an integrated channel, that has is accessible from one side of the side wall, through a reduced dimension entrance defined between opposed shoulders of the channel, the channel having an enlarged cavity extending into the main body of the slab on an opposite side of the wall, lengthwise of the formwork element.

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Preferably, the lateral flange projects from a bottom of the side wall and the grip extends upwardly into the body of the slab.

Preferably, the formwork element includes a second lateral flange that projects from a top of the side wall, the second lateral flange having a grip that extends downwardly into the main
25 body of the slab.

Preferably, the second lateral flange has a groove formed in an external face of the flange, opposite the slab, to provide a second anchor site for a load transfer member attached
30 externally of the composite structure.

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Preferably, the formwork element is formed as a single piece, with radiused corners between the side wall, lateral flange and grip, to reduce stress concentration.

In another aspect, there is provided a construction assembly including the composite structure,
5 as described above and a load transfer member attached to the formwork element.

Preferably, the member is an external load transfer member and the assembly further includes a attachment adapted to attach the member to the formwork element by clamping on to the anchor site.

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Preferably, the groove extends lengthwise of the formwork element to allow adjustment of the lengthwise positioning of the attachment relative to the formwork element.

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Preferably, the lateral flange projects from a bottom of the side wall and the grip extends upwardly into the body of the slab, the formwork element includes a second lateral flange that projects from a top of the side wall, the second lateral flange having a grip that extends downwardly into the main body of the slab to provide a second anchor point, and wherein the attachment is adapted to clamp on to one or both of the first and second anchor sites.

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Preferably, the side wall includes an integrated channel, that is accessible from one side of the side wall, through a reduced dimension entrance defined between opposed shoulders of the channel, the channel having an enlarged cavity extending into the main body of the slab on an opposite side of the wall, lengthwise of the formwork element, and wherein the member is cantilevered into the cavity.

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Preferably, assembly further includes an internal load transfer member with an attachment that connects into the space between the associated grip, side wall and the integrated channel.

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In another aspect, there is provided a formwork element for use in the composite structure described above, including a side wall, against which concrete is poured to define a side of a concrete slab, and a lateral flange that covers a top or bottom peripheral edge of the slab:

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wherein

the lateral flange has a grip adapted to extend into a main body of the slab in a vertical direction, to form a space between the grip and the side wall, which is substantially filled with concrete such that the concrete locks into the space in order to structurally integrates the element with the concrete slab; and wherein

the lateral flange has a groove formed in an external face of the flange, to serve as an anchor site for a load transfer member fitted to the formwork element.

Preferably, the grip is formed as an indent arranged to project inwardly from the associated top or bottom peripheral edge of the slab.

Preferably, the groove is formed at a reverse side of the indent.

Preferably, the indent includes an angled first section that arranged to extend into the body of the slab and a return section that acts as a barrier to restrict concrete being poured over the indent and into the groove, during pouring of the slab.

Preferably, the side wall includes an integrated channel, that has is accessible from one side of the side wall, through a reduced dimension entrance defined between opposed shoulders of the channel, the side wall projecting from an opposite side so as to define an enlarged internal cavity, lengthwise of the formwork element.

Preferably, the lateral flange projects from a bottom of the side wall and the grip extends upwardly.

Preferably, the formwork element includes a second lateral flange that projects from a top of the side wall, the second lateral flange having a downwardly extending grip.

Preferably, the second lateral flange has a groove formed in an external face of the flange to

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provide a second anchor site for the load transfer member.

Preferably, the formwork element of claim 16, formed as a single piece, with radiused corners between the side wall, lateral flange and grip, to reduce stress concentration.

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Preferably, the formwork element is formed by a process of bending a single sheet of material.

Brief Description of the Drawings

10 The invention is described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

Figure 1 is a partial perspective view of a formwork element;

15 Figure 2 is an enlarged view of an integrated channel of the formwork element;

Figure 3 is a perspective view of formwork;

Figure 4 is a cross-sectional view of a composite structure;

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Figure 5 is a partial perspective view of the formwork;

Figure 6A is a profile of a formwork element;

25 Figure 6B is a profile of another formwork element;

Figure 6C is a profile of yet another formwork element;

Figure 7 is a partial perspective view of another example of a formwork element;

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Figure 8 is a partial perspective view of the formwork element of Figure 8, with a load transfer

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member fitted into an integrated channel of the element;

Figure 9A is a perspective view of another example of a load transfer member;

5 Figure 9B is a perspective view of a further example of a load transfer member;

Figure 9C is a perspective view of another load transfer member;

Figure 9D is a perspective view of yet another load transfer member;

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Figure 10 is a partial perspective view of an external load transfer member fitted to the formwork element;

Figure 11 is a partial perspective view of another formwork element, without an integrated
15 channel;

Figure 12 is a perspective view of formwork, including the element of Figure 11;

Figure 13 is cross-sectional view of a composite structure, incorporating the formwork of
20 Figure 12;

Figure 14 is a side view of a section of the formwork;

Figure 15 is a partial perspective view of the formwork element with an external load transfer
25 member attached;

Figure 16 illustrates another example of formwork element;

Figure 17 is a cross-section view of an other example of a formwork element with an external
30 and internal load transfer member attached;

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Figure 18A is a perspective view of an example of an external load transfer member;

Figure 18B is a perspective view showing parts of the load transfer member separated; and

- 5 Figure 19 is a perspective view of a formwork element with internal and external load transfer members.

Detailed Description of the Invention

- 10 Referring to Figure 1, a formwork element 1 has a side wall 2, with a lateral flange 3 projecting from a bottom end 4 of the side wall 2, to form a base 5 of the element 1. A second flange 6 projects from a top end 7 of the side wall 2. The second flange 6 is angled downwardly to form a grip 8.

- 15 The side wall 2 includes an integrated channel 9, shown in more detail in Figure 2. The channel 9 has a reduced dimension entrance 10, defined between shoulders 11, on one side 12 of the wall 2. The channel 9 is formed by an enlarged ridge portion 13 that projects to an opposite side 14 of the wall 2 so as to define an internal cavity 15 that preferably has a generally dovetail shape. The ridge portion 13 and channel 9 extend along the length of the
20 element 1.

- Referring now to Figure 3, formwork 16 is shown as including a horizontal formwork sheet 17 and the formwork element 1, which defines a peripheral edge 18 of the formwork 16. The sheet 17 is positioned on the base 5 of the element 1, between the channel 9 and the flange 3.

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A composite structure 20 is shown in Figure 4 as including a concrete slab 21 formed of concrete that has been poured into the formwork 16 and allowed to set. Formwork elements 1 are positioned around all sides 22 of the slab 21, in order to contain the concrete during the pouring operation.

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The slab 21 has a main body 23 with a top surface 24 and a bottom surface 25. The flange 3

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covers at least a portion of a bottom peripheral edge 26 of the slab 21. The bottom surface 25 is formed on top of the sheet 17, that in turn rests on the base 5 of each element 1. In this case, the sheet 17 is designed to be left in the composite structure 20. In an alternative, the sheet 17 may be replaced by structure such as timber formwork (not shown) that can be stripped out of
5 the composite structure 20 after the concrete has set.

The enlarged ridge portion 13 serves to structurally integrate the formwork element 1 in the slab 21, while the flange 6 offers similar functionality. In particular, the grip 8 is cast into the slab 21 and projects in a vertically downward direction into the body 23 to form a space 27
10 between the side wall 2 and the grip 8. In order to form the slab 21, concrete is initially poured over the sheet 17 and then up against the side wall 2, to form the sides 28 of the slab 21. Continued pouring of the concrete up to the top surface 24 causes concrete to fill the space 27 and, when set, the concrete forms a mechanical lock with the flange 6 to further integrate the formwork element 1 into the composite structure 20.

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Referring to Figure 5, the formwork 16 includes a diagonal brace 19 to provide lateral support to the side wall 2 of the element 1, during the pouring operation. The brace 19 is attached directly to an upper side of the flange 6 and is secured to the sheet 17 using bolts 38.

20 With reference to Figures 6A to 6C, where like parts are denoted with like reference numerals, formwork elements 1 are shown, each with a different shaped integrated channel 9. Figure 6A illustrates a channel 9 with a square cross section. Figure 6B shows a channel 9 with an extended throat 29, while Figure 6C shows a more rounded channel 9.

25 With regard to Figure 7, like reference numerals are again used to denote like parts. Figure 7 shows another formwork element 1. However, in this case, the bottom flange 3 is formed with a grip 30 that extends in a vertical direction, upwardly from the base 8.

The grip 30 is in the form of an indent 31 and includes an angled first section 32 and a return
30 section 33. A groove 34 is formed in an external face 35 of the flange 3, at a reverse side 36 of the indent 31. The indent 31 and the groove 34 extend lengthwise of the element 1.

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When incorporated in a composite structure, the flange 3 extends over a bottom peripheral edge of an associated concrete slab (not shown) and the indent 31 projects vertically into the slab. The space 27 between the indent 31 and the wall 2 serves as a mechanical lock, when
5 filled with concrete, to further integrate the element 1 in the composite structure. The groove 34 also serves as an anchor point for attachment of a load transfer member (such as described with reference to Figure 15, for example).

Referring to Figure 8, a construction assembly 40 is illustrated. Like reference numerals are
10 again used to denote like parts. The assembly 40 includes the formwork element 1 of Figure 7 and an external load transfer member 41 attached to the element 1. The element 1 is embedded in a concrete slab (not shown), which has been omitted for clarity.

The member 41 is shown with an angled attachment 42 inserted into the channel 9 so that the
15 member 41 is cantilevered to the element 1. The lengthwise positioning of the member 41 can be adjusted by simply sliding the member 41 along the elongate channel 9, as required.

Referring to Figure 9, different forms of the attachment 42 are shown. In Figure 9A, the attachment 42 is a tapered wedge 43 with a threaded coupling 44. The wedge is designed to be
20 rotated from a sideways insertion orientation to the installed orientation, as shown.

Figure 9B shows the attachment 42 in the form of two plates 45, with bolt hole couplings 46. Figure 9C illustrates the attachment 42 as a single piece wedge-shaped plate 47, with coupling
25 holes 48. Figure 9D shows the attachment 42 as a wedge 49.

With regard to Figure 10, another construction assembly 40 is illustrated, with a formwork element similar to the element 1 shown in Figure 8, and like reference numerals are used to denote like parts. The difference between the elements 1 of Figures 8 and 10 is the top lateral
30 flange 6 in Figure 10 is formed with a differently configured grip 50.

The flange 6 is designed to extend over a top peripheral edge of a slab (not shown) and the

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grip 50 includes an indent 51 that projects in a vertically downward direction. The indent includes a downwardly angled section 52 and a return section 53, so as to form a groove 54 in an external face 57 of the flange 6, at a reverse side 58 of the indent 51.

- 5 The space 27 between the indent 51 and the wall 2, serves as a mechanical lock, when filled with concrete, to assist in integrating the formwork element 1 into a composite structure including a concrete slab (not shown) and the element 1.

The groove 54 provides an anchor site 59 for an external load bearing member 41. In this case, 10 the member 41 has an attachment 42 formed of two jaws 55, 56. The jaw 55 is mounted in the channel 9 and the jaw 56 is clamped over the top of the side wall 2 and into the groove 54.

Turning now to Figure 11, where like reference numerals are used to denote like parts, another formwork element 60 is shown. The element 60 is similar to that shown in Figure 10, except 15 the integrated channel 9 has been removed and the side wall 2 is formed as a simple vertical wall. The element 60 otherwise has the same features and includes a lower flange 3 with a grip 30 is in the form of an indent 31 that includes an angled first section 32 and a return section 33. A groove 34 is formed in an external face 35 of the flange 3, at a reverse side 36 of the indent 31. The indent 31 and the groove 34 extend lengthwise of the element 1.

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The element 60 also includes a grip 50 in the upper flange 6. The grip 50 includes an indent 51 that projects in a vertically downward direction. The indent 51 has a downwardly angled section 51 and a return section 52, so as to form a groove 53 in an external face of the flange 6, at a reverse side 57 of the indent 51.

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Figure 12 shows formwork 61 that includes a formwork sheet 62 and the formwork element 60 that supports the sheet 62 on the base 5.

With reference to Figure 13, where like parts are denoted with like reference numerals, a 30 composite structure 20 that incorporates the formwork elements 60 is shown. As can be seen, the flange 6 covers the top peripheral edge of the slab 21 and the top surface 24 of the slab 21

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is level with the return section 52 of the indent 51. As such, the return section 52 provides a barrier 63, to restrict concrete from being poured into the groove 53 during formation of the slab 21.

5 The lower flange 3 covers a bottom peripheral edge of the slab 21 and forms the base 5 that supports the sheet 62. The grip 30 projects upwardly into the slab 21, to provide a mechanical lock with the concrete in the space between the grip 30 and the side wall 2. The associated groove 34 also forms an anchor site 65 for attachment of a load transfer member, as described below with reference to Figure 15.

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With regard to Figure 14, the formwork 61 may include a diagonal brace 64 between the sheet 62 and the flange 6, to provide structural support to the formwork element 60 as the slab is being poured. The brace 64 is attached to an underside 65 of the flange 6, so as to leave the groove 53 clear of obstruction.

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Turning now to Figure 15, a construction assembly 70 is shown that includes the formwork element 60 and an external load transfer member 71. The member includes an attachment 42, formed of two parts 63, 64, that clamps onto anchor sites 59, 65 provided by the grooves 34, 54. The grooves 34, 54 extend lengthwise of the element 60 so that position of the attachment

20 42 can be adjusted, as required.

Figure 16 illustrates another version of the assembly 70, where the grooves 34, 54 have a profile that is more square shaped jaws 66, 67 of the parts 63, 64 of the attachment 42 are modified to suit.

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Figure 17 shows another formwork element 72 of a construction assembly 73. The formwork element 72 includes an integrated channel 9 cast into a slab 21. An external load transfer member 74 is fitted to the element 72 via a head 75 that fits inside the channel 9, through the opening 10 formed in the side 12 of the element 72. A lock device 76 with a screw tensioning mechanism 77 allows the member 74 to be secured in place.

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An internal load transfer member 78 is attached to the enlarged ridge portion 13. The member 78 is in the form of a clamp 79 that is connected to a tensioning rod 80, reinforcing bar, or the like embedded in the slab 21.

- 5 Figure 18A and 18 B show the clamp 79 as being formed in two parts 81, 82 so that each part 81, 82 can be positioned around the ridge portion 13 of Figure 17 and then slid laterally into engagement.

10 With reference to Figure 19, the construction assembly 40 of Figure 10 is shown as including a further, internal load transfer member 83. The member 83 has an attachment 84 that is fitted into the space 27 between the grip 50, the side wall 2 and the ridge portion 13 so as to wedge the attachment 84 in place. The attachment 84 is connected to a reinforcing bar 85 or the like that can be used to either support the element 1 during pouring of the slab and/or to provide for further mechanical integration of the element with the construction assembly 40.

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In all the above embodiments, the formwork element 1 is preferably made from a single piece of sheet material, such as corrosion resistance treated steel. The element 1 is formed by a process of bending so that there are no sharp corners and all the joins between, say, the flanges 3, 6, grips 30, 50, channel 9 and wall 2 are radiused, which helps reduce stress concentrations
20 in the element.

It may be appreciated that although the formwork element has been described with reference to a concrete slab or structure, the invention has application to any other type of suitable material that.

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List of Parts

1. Formwork element
2. Side wall
- 5 3. Flange
4. Bottom end
5. Base
6. Flange
7. Top end
- 10 8. Grip
9. Channel
10. Entrance
11. Shoulders
12. Side
- 15 13. Ridge portion
14. Opposite side
15. Cavity
16. Formwork
17. Formwork sheet
- 20 18. Peripheral edge
19. Brace
20. Composite structure
21. Slab
22. Side
- 25 23. Body
24. Top surface
25. Bottom surface
26. Bottom peripheral edge
27. Space
- 30 28. Side
29. Throat

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- 30. Grip
- 31. Indent
- 32. First section
- 33. Return section
- 5 34. Groove
- 35. External face
- 36. Reverse side
- 37. Upper side
- 38. Bolts
- 10 39.
- 40. Construction assembly
- 41. Load transfer member
- 42. Attachment
- 43. Wedge
- 15 44. Coupling
- 45. Plate
- 46. Coupling
- 47. Plate
- 48. Coupling hole
- 20 49. Wedge
- 50. Grip
- 51. Indent
- 52. Angled section
- 53. Return section
- 25 54. Groove
- 55. Jaw
- 56. Jaw
- 57. Face
- 58. Reverse side
- 30 59. Anchor site
- 60. Formwork element

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- 61. Formwork
- 62. Formwork sheet
- 63. Part
- 64. Part
- 5 65. Anchor site
- 66. Jaw
- 67. Jaw
- 68.
- 69.
- 10 70. Construction assembly
- 71. Load transfer member
- 72. Formwork element
- 73. Construction assembly
- 74. Load transfer mechanism
- 15 75. Head
- 76. Lock device
- 77. Tensioning mechanism
- 78. Load transfer member
- 79. Clamp
- 20 80. Rod
- 81. Part
- 82. Part
- 83. Internal load transfer member
- 84. Attachment
- 25 85. Bar

The Claims

1. A composite structure formed of a concrete slab and an integrated formwork element, wherein:

5 the formwork element includes a side wall, against which concrete is poured to define a side of the slab, and a lateral flange that covers a top or bottom peripheral edge of the slab, wherein:

the lateral flange has a grip that extends into a main body of the slab in a vertical direction, to form a space between the grip and the side wall, which is substantially filled with
10 concrete such that the concrete locks into the space and structurally integrates the element with the concrete slab: and wherein:

the lateral flange has a groove formed in an external face of the flange, opposite the slab, to serve as an anchor site for a load transfer member attached externally of the composite structure by being fitted to the formwork element.

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2. The composite structure of claim 1, wherein the grip is formed as an indent projecting inwardly from the associated top or bottom peripheral edge of the slab.

3. The composite structure of claim 2, wherein the groove is formed at a reverse side of
20 the indent.

4. The composite structure of claim 3, wherein the indent includes an angled first section that extends into the body of the slab and a return section that acts as a barrier to restrict concrete being poured over the indent and into the groove.

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5. The composite structure of claim 1, wherein the side wall includes an integrated channel, that has is accessible from one side of the side wall, through a reduced dimension entrance defined between opposed shoulders of the channel, the channel having an enlarged cavity extending into the main body of the slab on an opposite side of the wall, lengthwise of
30 the formwork element.

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6. The composite structure of claim 2, wherein the lateral flange projects from a bottom of the side wall and the grip extends upwardly into the body of the slab.
7. The composite structure of claim 6, wherein the formwork element includes a second lateral flange that projects from a top of the side wall, the second lateral flange having a grip that extends downwardly into the main body of the slab.
8. The composite structure of claim 7, wherein the second lateral flange has a groove formed in an external face of the flange, opposite the slab, to provide a second anchor site for a load transfer member attached externally of the composite structure.
9. The composite structure of any one of claim 1, wherein the formwork element is formed as a single piece, with radiused corners between the side wall, lateral flange and grip, to reduce stress concentration.
10. A construction assembly including the composite structure of claim 1 and a load transfer member attached to the formwork element.
11. The construction assembly of claim 10, wherein the member is an external load transfer member that includes a attachment adapted to attach the member to the formwork element by clamping on to the anchor site.
12. The construction assembly of claim 11, wherein the groove extends lengthwise of the formwork element to allow adjustment of the lengthwise positioning of the attachment relative to the formwork element.
13. The construction assembly of claim 12, wherein the lateral flange projects from a bottom of the side wall and the grip extends upwardly into the body of the slab, the formwork element includes a second lateral flange that projects from a top of the side wall, the second lateral flange having a grip that extends downwardly into the main body of the slab to provide a second anchor point, and wherein the attachment is adapted to clamp on to one or both of the

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first and second anchor sites.

14. The construction assembly of any one of claims 10 to 13, wherein the side wall includes an integrated channel, that is accessible from one side of the side wall, through a
5 reduced dimension entrance defined between opposed shoulders of the channel, the channel having an enlarged cavity extending into the main body of the slab on an opposite side of the wall, lengthwise of the formwork element, and wherein the member is cantilevered into the cavity.

10 15. The construction assembly of claim 14, further including an internal load transfer member with an attachment that connects into the space between the associated grip, side wall and the integrated channel.

16. A formwork element for use in the composite structure of claim 1, including a side
15 wall, against which concrete is poured to define a side of a concrete slab, and a lateral flange that covers a top or bottom peripheral edge of the slab, wherein:

the lateral flange has a grip adapted to extend into a main body of the slab in a vertical direction, to form a space between the grip and the side wall, which is substantially filled with
20 concrete such that the concrete locks into the space in order to structurally integrates the element with the concrete slab; and wherein

the lateral flange has a groove formed in an external face of the flange, to serve as an anchor
site for a load transfer member fitted to the formwork element.

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17. The formwork element of claim 16, wherein the grip is formed as an indent arranged to project inwardly from the associated top or bottom peripheral edge of the slab.

18. The formwork element of claim 17, wherein the groove is formed at a reverse side of
30 the indent.

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19. The formwork element of claim 18, wherein the indent includes an angled first section that arranged to extend into the body of the slab and a return section that acts as a barrier to restrict concrete being poured over the indent and into the groove, during pouring of the slab.
- 5 20. The formwork element of claim 16, wherein the side wall includes an integrated channel, that has is accessible from one side of the side wall, through a reduced dimension entrance defined between opposed shoulders of the channel, the side wall projecting from an opposite side so as to define an enlarged internal cavity, lengthwise of the formwork element.
- 10 21. The formwork element of claim 16, wherein the lateral flange projects from a bottom of the side wall and the grip extends upwardly.
22. The formwork element of claim 21, wherein the formwork element includes a second lateral flange that projects from a top of the side wall, the second lateral flange having a
15 downwardly extending grip.
23. The formwork element of claim 22, wherein the second lateral flange has a groove formed in an external face of the flange to provide a second anchor site for the load transfer member.
- 20 24. The formwork element of claim 16, formed as a single piece, with radiused corners between the side wall, lateral flange and grip, to reduce stress concentration.
- 25 25. The formwork element of claim 24, formed by a process of bending a single sheet of material.