

A JOINT

5 The present invention relates to a joint for adjacent sheets of a steel decking.

10 The present invention relates particularly, although by no means exclusively, to a joint for adjacent decking sheets that form part of a composite slab of a floor of a multi-storey building.

15 There are a number of known flooring systems for multi-storey buildings that include composite slabs of steel decking and concrete cast on the decking. The flooring systems include systems described as (i) wall and slab system; (ii) flat slab system; (iii) beam and two-way slab system; (iv) beam and one-way slab system and (v) bandbeam system.

20 In general terms, it is known to construct floors of multi-storey buildings by positioning profiled steel decking sheets on a suitable support system, such as steel or concrete horizontal beams or vertical columns, to form a decking system and pouring concrete onto the decking sheets to form composite slabs. The decking acts as a formwork in the construction of the composite slabs and as a reinforcement in the resultant composite slabs. The composite slabs may also include other reinforcement, such as deformed bars or welded wire fabric.

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 The present invention is a joint for adjacent decking sheets which relies on a clamping action to hold together the sheets.

35 According to the present invention there is provided a joint for adjacent decking sheets, which includes:

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- 5 (a) an elongate base member that can be positioned in use of the joint to straddle a join between adjacent decking sheets and contact undersurfaces of the decking sheets,
- 10 (b) a plurality of studs extending from the base member at spaced intervals along the length of the base member and positioned in use in a gap between the decking sheets,
- 15 (c) an elongate top member that can be positioned in use to straddle the join between the decking sheets and contact upper surfaces of the decking sheets, the top member having a plurality of openings which allow the top member to be positioned on upper surfaces of the decking sheets with the studs extending through the openings, and
- 20 (d) a plurality of fastening means that can engage the studs and apply a clamping force which holds the top member against the decking sheets.

25 The above-described joint may be used for a number of purposes. One particular purpose is to join together unsupported ends and/or sides of adjacent decking sheets during construction of a flooring system and, more particularly, prior to concrete being poured onto and hardening on the sheets. The joint has the advantages of

30 defining a robust formwork system, preventing concrete leakage by holding down ends/sides and sealing ribs (if open ended), avoiding the need for bearers/falsework to support ends and sides, and providing a neat and attractive finish on the undersurface of adjacent sheets. Another particular

35 purpose is to tie unsupported ends of adjacent decking sheets to concrete when slabs or bandbeams are loaded significantly. The joint has the advantage of

preventing delamination due to peeling away of the otherwise unsupported decking ends that could lead to catastrophic failure.

5 According to the present invention there is also provided a decking system which includes, at least two adjacent decking sheets, and at least one joint of the type described in the preceding paragraph positioned at a join between the decking sheets and holding the decking sheets
10 together.

 According to the present invention there is also provided a composite slab for a floor of a building which includes, a decking system, and a layer of concrete on the
15 decking system, and which decking system includes at least two adjacent decking sheets and at least one joint of the type described above positioned at a join between the decking sheets and holding the decking sheets together.

20 Preferably the length of one or more of the studs is selected so that an upper end of the stud is embedded in the concrete and provides resistance to delamination of the decking sheets and the concrete layer.

25 Preferably the concrete is reinforced and/or prestressed.

 The present invention is described further by way of example with reference to the accompanying drawings, of
30 which:

 Figure 1 illustrates a preferred embodiment of a joint between two adjacent decking sheets which are positioned in-line and on the same horizontal plane;

Figure 2 illustrates a preferred embodiment of a joint between two adjacent decking sheets which are positioned perpendicular to each other;

5 Figure 3 illustrates a preferred embodiment of a joint between two adjacent decking sheets which are positioned side-by-side but not in overlapping relationship; and

10 Figure 4 illustrates a preferred embodiment of a joint between two adjacent decking sheets which are positioned in-line and on different horizontal planes.

15 The following description focuses particularly on use of the joints to hold together adjacent unsupported ends and sides of decking sheets as shown in the drawings and not on (a) the form of the decking sheets, (b) how the decking sheets are supported at other parts of the sheets, and (c) the end-use of the decking sheets.

20 The present invention is not limited to holding together unsupported ends and sides of adjacent decking sheets and extends to decking sheets that are supported at adjacent ends and sides.

25 In addition, the present invention is not limited to the particular forms of decking sheets shown in the drawings. By way of example, another suitable decking sheet is a widely used trapezoidal profile.

30 In addition, whilst the following description is in the context of decking sheets that form part of a composite slab of a flooring system of a multi-storey building (which term includes carparks), the present invention is not limited to decking sheets that are used for this end-use
35 application. In this application, the flooring

system may be any suitable system, such as systems described as (i) wall and slab system; (ii) flat slab system; (iii) beam and two-way slab system; (iv) beam and one-way slab system; and (v) bandbeam system.

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The decking sheets are profiled steel sheets that have a series of parallel reinforcing ribs roll-formed in a generally flat base.

10 Specifically, the decking sheets include a lap rib 5 on one side of each sheet and a series of intermediate ribs 7 that are parallel to the lap rib 5 and are located between the lap rib 5 and the other side of each sheet.

15 The lap rib 5 includes an upstanding section 9, an inturned flat section 11, and a downwardly extending flange section 13. The intermediate ribs 7 are of dovetail configuration with upstanding sections 27 and a flat section 29. For the purpose of the following discussion the side of
20 the sheet that includes the lap rib 5 is referred to as the "leading side" and the other side of the sheet is referred to as the "trailing side".

The decking sheets may be of any suitable dimensions.
25 Typically, the decking sheets are 600mm wide, 8.4m long, and have a rib height of 54mm.

Figures 1 to 4 show four different types of join between adjacent decking sheets. Whilst there are
30 differences in detail, the joints for these joins have common elements, namely:

(a) an elongate base member 15 positioned in use
35 to straddle the join and contact the undersurface of each sheet;

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- 5 (b) a plurality of studs 17 having threaded upper ends welded to the base member 15 at spaced intervals along the length of the base member 15 and positioned in use in a gap G between the decking sheets;
- 10 (c) an elongate top member 21 positioned to straddle the join between the decking sheets and contact upper surfaces of the decking sheets, the top member 21 having a series of openings (not shown) which allow the top member 21 to be positioned with the studs 17 extending through the openings;
- 15 (d) a plurality of fastening means 23 in the form of speed clips or nuts or other suitable means that engage the studs 17 and apply a clamping force which holds the top member 21 against the decking sheets.

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In the embodiment shown in Figure 1, in which the decking sheets are in-line and the join involves adjacent ends of the sheets, the base member 15 is in the form of a flat 50mm by 2mm thick zinc coated steel plate, the studs 17 are in the form of resistance welded 10mm diameter threaded members spaced at 200mm centres along the length of the base member 15, and the top member 21 is in the form of a U-shaped 50mm by 25mm by 2mm thick channel section.

30 More specifically, the top member 21 is positioned in use so that the arms 25 of the channel extend downwardly from side edges of a central web 31 and the free edges of the arms contact the upper surfaces of the ribs 5, 7. The engagement of the fastening means 23 and the threaded studs 35 17 forces the top member 21 against the ribs 5, 7 and the decking sheets against

the base member 15, with the result that the two in-line decking sheets shown in the figure are clamped securely together.

5 In use, in the construction of a flooring system the joined decking sheets define part of the formwork for the floor. Subsequently, concrete is poured onto the sheets to form a composite slab. In this context, the upper ends of the studs 17 become embedded in the concrete and by making
10 them sufficiently long contribute to resisting delamination of the hardened concrete and the decking sheets.

 In the embodiment shown in Figure 2, in which the adjacent decking sheets are perpendicular to each other and
15 therefore the join involves an end of one sheet and a side of an adjacent sheet, the base member 15, the studs 17 and the fastening means 23 are as described in relation to the Figure 1 embodiment.

20 The main difference between the two embodiments is in the construction of the top member 21. Specifically, the top member 21 shown in Figure 2 is formed as a C-shaped channel in order to provide contact surfaces with the upper surfaces of the ribs 5, 7 of the left hand decking sheet and
25 the trailing side of the right hand decking sheet.

 In the embodiment shown in Figure 2, in which the adjacent decking sheets are arranged side-by-side and therefore the join involves sides of adjacent sheets, the
30 base member 15, the studs 17, the fastening means 23, and the top member 21 are as described in relation to the Figure 1 embodiment.

 In the embodiment shown in Figure 4, in which the
35 adjacent decking sheets are arranged in-line and at

different levels, the base member 15 is formed as a Z-shaped section from 2mm thick, zinc coated steel plate. The Z-shaped sections make it possible for the base member 15 to accommodate the different levels of the decking sheets.

5 Specifically, the base member 15 includes an upper arm 35, a parallel lower arm 37 and an interconnecting web 39. As with the other embodiments the studs 17 are welded to the base member 15. Specifically, the studs 17 are welded to the upper arm 35 of the plate. In addition, in order to

10 accommodate the different levels of the upper surfaces of the ribs 5, 7 of the adjacent decking sheets, the top member 21 is formed as a C-shaped channel.

The above-described embodiments of the joint of the

15 present invention are an effective means of securely holding together adjacent decking sheets.

In addition, in terms of construction of concrete slabs for floors of multi-storey buildings, the joints are

20 an effective means of minimising concrete leakage via the joins between adjacent sheets.

Many modifications may be made to the preferred embodiments described above without departing from the

25 spirit and scope of the present invention.

By way of example, whilst the preferred embodiments are described in the context of decking sheets that are in-line or perpendicular, the present invention is not so

30 limited and extends to arrangements in which adjacent slabs are otherwise angled with respect to each other.

CLAIMS:

1. A joint for adjacent decking sheets, which includes:

- 5 (a) an elongate base member that can be positioned in use of the joint to straddle a join between adjacent decking sheets and contact undersurfaces of the decking sheets,
- 10 (b) a plurality of studs extending from the base member at spaced intervals along the length of the base member and positioned in use in a gap between the decking sheets,
- 15 (c) an elongate top member that can be positioned in use to straddle the join between the decking sheets and contact upper surfaces of the decking sheets, the top member having a plurality of openings which
- 20 allow the top member to be positioned on upper surfaces of the decking sheets with the studs extending through the openings, and
- 25 (d) a plurality of fastening means that can engage the studs and apply a clamping force which holds the base member and the top member against the decking sheets.

30 2. The joint defined in claim 1 wherein the elongate top member is in the form of a channel member having a central web and a pair of arms extending from side edges of the web, with the ends of the arms forming contact surfaces for upper surfaces of the decking sheets.

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3. The joint defined in claim 2 wherein the arms are the same length.

4. The joint defined in claim 2 wherein the arms are different lengths.

5. A decking system which includes at least two adjacent decking sheets and at least one joint defined in any one of the preceding claims at a join between the decking sheets and holding the decking sheets together.

6. The decking system defined in claim 5 wherein each decking sheet includes a lap rib on one lengthwise extending side of the sheet and parallel lengthwise extending intermediate ribs between the lap rib and the other side of the sheet.

7. The decking system defined in claim 6 wherein, in situations in which the join is between adjacent decking sheets that are lengthwise extending in line, the arms of the elongate top member are the same length.

8. The decking system defined in claim 6 wherein, in situations in which the join is between adjacent decking sheets that are arranged perpendicular to each other and involve an end of one sheet and the side of the other sheet that is opposite the lap rib of that sheet, the arms of the elongate top member are different lengths.

9. The decking system defined in claim 6 wherein, in situations in which the join is between adjacent decking sheets that are positioned side-by-side and the join involves the lap rib of one sheet and the side of the other sheet that is opposite in the lap rib of that sheet, the arms of the elongate top member are different lengths.

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10. A composite slab for a floor of a building which includes, a decking system defined in any one of claims 5 to 9 and a layer of concrete on the decking system.

5 11. The composite slab defined in claim 10 wherein the length of one or more of the studs of the joint is selected so that an upper end of the or each stud is embedded in the concrete and provides resistance to delamination of the decking sheets and the concrete layer.

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12. A joint for adjacent decking sheets which are positioned in-line and on the same horizontal plane as shown in Figure 1.

15 13. A joint for adjacent decking sheets which are positioned perpendicular to each other as shown in Figure 2.

14. A joint for adjacent decking sheets which are positioned side-by-side but not in overlapping relationship
20 as shown in Figure 3.

15. A joint for adjacent decking sheets which are positioned in-line and on different horizontal planes as shown in Figure 4.

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16. A decking system as described herein which includes at least two adjacent decking sheets which are positioned in-line and on the same horizontal plane and at least one joint positioned at a join between the decking sheets and holding
30 the decking sheets together as shown in Figure 1.

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17. A decking system as described herein which includes at least two adjacent decking sheets which are positioned perpendicular to each other and at least one joint positioned at a join between the decking sheets and holding
5 the decking sheets together as shown in Figure 2.

18. A decking system as described herein which includes at least two adjacent decking sheets which are positioned side-by-side but not in overlapping relationship and at least one
10 joint positioned at a join between the decking sheets and holding the decking sheets together as shown in Figure 3.

19. A decking system as described herein which includes at least two adjacent decking sheets which are positioned in-
15 line and on different horizontal claims and at least one joint positioned at a join between the decking sheets and holding the decking sheets together as shown in Figure 4.

20. A composite slab as described herein which includes:
20 (a) at least two adjacent decking sheets, (b) at least one joint as defined in any one of claims 12 to 15 positioned at a join between the decking sheets and holding the decking sheets together, and (c) a layer of concrete on the decking sheets.