

METAL DECKING

FIELD OF THE INVENTION

5 The present invention relates generally to metal decking and a method of forming metal decking. The invention relates particularly though not exclusively to metal decking for concrete clad roofing or flooring.

10 SUMMARY OF THE INVENTION

 According to one aspect of the present invention there is provided a metal decking member for use in a composite structure, the member being elongate and of a C cross-section profile comprising a web and a pair of
15 flanges extending from opposite longitudinal edges of the web, in use the member being connected to an adjacent said member so that said connected members form metal decking, wherein the web is longitudinally pre-cambered inwardly of the metal decking member so as to reduce outward
20 deflection of said metal decking member when casting concrete on said decking.

 Preferably the web together with the opposing flanges are longitudinally precambered.

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 According to another aspect, the present invention provides a metal decking member being elongate and of a C cross-section profile comprising a web and a pair of flanges extending from opposite longitudinal edges of the
30 web, the web incorporating transverse corrugations cold roll formed in the web, said corrugations inducing a longitudinal pre camber in said web which is directed inwardly of the decking member.

Preferably the transverse corrugations are cold roll formed in the web. More preferably the transverse corrugations are relatively light.

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According to another aspect, the present invention provides a metal decking member being elongate and of C cross-section profile including a web and a pair of flanges extending from opposite longitudinal edges of the web, each flange including a first part upstanding from the web, and a second part extending from an upper margin of the first part, the second part extending inwardly from the first part so as to be disposed over said web, wherein the web is longitudinally pre-cambered inwardly of the metal decking member.

Preferably the longitudinal precamber is up to about 2% measured as the maximum longitudinal offset of the web from a substantially flat plane and expressed as a percentage relative to the length of the web. More preferably the longitudinal precamber is between about 0.4% to 1%. In one embodiment this equates to a precamber of between about 20 to 50 mm for an unsupported span of 5 metres.

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Preferably the web in transverse section is precambered inwardly of the metal decking member. More preferably the transverse pre-camber is up to about 5% measured as the maximum offset of the web from a substantially flat plane and expressed as a percentage relative to the width of the web. Still more preferably the transverse pre-camber is between about 1% to 4%.

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In yet a further aspect, the present invention provides a metal decking member for use in a composite structure, the member being elongate and of a C cross-section profile comprising a web and a pair of
5 flanges extending from opposite longitudinal edges of the web, each flange of the member being adapted to be connected to the flange of another said member so that said connected members form metal decking, wherein the web in transverse section is pre-cambered inwardly of the
10 metal decking so as to reduce outward deflection of said metal decking when casting concrete on said decking.

In another aspect, the present invention provides a metal decking member being elongate and of a
15 C cross-section profile comprising a web and a pair of flanges extending from opposite longitudinal edges of the web, each flange including a first part upstanding from the web, and a second part extending from an upper margin of the first part, the second part extending inwardly from
20 the first part so as to be disposed over said web, and wherein the web in transverse section is pre-cambered inwardly of the metal decking.

Preferably the transverse precamber is up to about 5%
25 measured as the maximum offset of the web from a substantially flat plane and expressed as a percentage relative to the width of the web. More preferably the transverse precamber is between about 1% to 4%.

30 Preferably the pair of opposing flanges are disposed symmetrically either side of an imaginary longitudinal axis of the metal decking member. More preferably the C

cross-section profile of the metal decking member is substantially symmetrical.

5 Preferably the flanges each include a longitudinally
extending rib. More preferably the ribs are shaped
complementary to and aligned with one another, one of the
ribs protruding outwardly and the other of said ribs
protruding inwardly whereby adjacent ribs of adjacent
decking members nest within one another.

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It has been found that precambering of the web is
effective in increasing the unsupported span of the metal
decking member. Generally the metal decking member is clad
or embedded in a concrete slab.

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Generally the metal decking member is one of a
plurality of metal decking members arranged alongside one
another to together form metal decking.

20 Preferably adjacent of the plurality of decking
members are secured together via fixing means. More
preferably said fixing means includes one or more
fasteners designed to engage adjacent flanges of adjacent
decking members. Alternatively said fixing means includes
25 a resilient clip configured to releasably engage free edge
portions of adjacent flanges of adjacent decking members.

30 Preferably the plurality of decking members are clad
or embedded in a concrete slab, and a further aspect of
the invention relates to a composite structure
incorporating the decking.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to facilitate a better understanding of the nature of the present invention a preferred embodiment of metal decking and its method of fabrication will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a sectional view of one embodiment of metal decking according to the invention;

10 Figure 2 is a perspective view of another embodiment of a metal decking member according to the invention; and

Figure 3 is a sectional view of alternative fixing means of the metal decking.

15 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Figure 1 there is metal decking 10 including a pair of adjacent metal decking members 12 and 14 located alongside one another. The metal decking 10 is designed to be embedded or clad in a concrete slab so as to form a roof or floor.

The adjacent metal decking members such as 12 and 14 are of an identical cross-sectional shape being elongate and of a C cross-section profile. The C cross-section metal decking member 12 includes a web 16 and a pair of opposing flanges 18 and 20, respectively. The metal decking such as 12 is of the C cross-section profile wherein opposing free edge portions 22 and 24 of the respective flanges 18 and 20 are turned inwardly.

Additionally, each of the free edge portions 22 and 24 includes a respective lip return 26 and 28 which is disposed generally parallel to the corresponding flange 18 or 20. The metal decking members such as 12 and 14 are
5 thus in cross-section of a substantially symmetrical configuration.

As shown in Figure 2 the web 16 of the metal decking member 12 is longitudinally pre-cambered inwardly of the
10 metal decking member 12. The metal decking member 12 is of the kind illustrated in Figure 1 but without the longitudinally extending ribs. The metal decking member which ordinarily is embedded in a concrete slab (not shown) is thus capable of spanning an increased distance
15 unsupported. The precamber of the web 16 is in this example about 0.6% measured as the maximum longitudinal offset of the web from a substantially flat plane and expressed as a percentage relative to the length of the web 16. It is understood that the longitudinally
20 precambered web 16 is at least partly deflected toward the flat plane under the significant weight of the concrete slab. Advantageously, this longitudinal precamber provides minimal deflection of the metal decking member 12 which spans increased distances. In this embodiment the metal
25 decking member 12 spans up to about 5 metres unsupported and includes a longitudinal precamber of about 30 mm which corresponds to 0.6 percent. The unsupported span of 5 metres of this embodiment of the invention compares to a span of up to 3 metres for conventional decking without a
30 longitudinal precamber.

As shown in Figure 1 the web 16 of the metal decking member 12 is also pre-cambered in transverse sectional

profile inwardly. The transverse pre-camber of the web 16 in this example is approximately 2% measured as the maximum offset of the web 16 from a substantially flat plane and expressed as a percentage relative to the width of the web 16. In this example the metal decking member 12 has a width of approximately 300 mm and is roll formed from sheet metal of a thickness of about 1.2 mm.

The flanges 18 and 20 include respective longitudinally extending ribs 30 and 32. The ribs 30 and 32 are roll formed in the lower portion of the respective flange 18 and 20 adjacent the web 16. One of the ribs 30 is formed as an inwardly directed protrusion whereas the other rib 32 is shaped complementary to the opposite rib 30 but directed outwardly of the decking member 12. The longitudinal ribs 30 and 32 are aligned so that adjacent ribs such as 32 and 34 of adjacent decking members 12 and 14 can nest within one another. Thus, nested ribs such as 32 and 34 inhibit vertical movement of the deck members 12 and 14 relative to one another and assists in alignment of the adjacent deck members 12 and 14.

The longitudinal precamber in the web 16 of the metal decking member 12 is formed by corrugating the web 16. The corrugations (not shown) are oriented transverse and extend partly across the width of the web 16. The transverse corrugations are cold roll formed in the web 16 are sufficiently "light" to provide the preferred longitudinal precamber of up to about 2%. The corrugations may be formed either in the flat strip or in the web 16 once it is formed into the C cross-section profile. Otherwise, corrugation of the web 16 is performed via corrugating rolls (not shown) in a

conventional cold roll forming manner.

Adjacent metal decking members 12 and 14 of this embodiment are secured together via a series of fasteners
5 in the form of screws such as 36 which engage abutting or adjacent flange such as 18 and 20 of adjacent decking members 12 and 14. The fasteners such as 36 are spaced longitudinally along the decking members such as 12 and 14. Figure 3 illustrates an alternative form of fixing
10 means for securing adjacent flanges of adjacent decking members together. The fixing means is in this alternative example in the form of a resilient clip 38 which releasably engages adjacent free edge portions such as 22 and 24 of adjacent decking members 12 and 14 respectively.
15 The resilient clip 38 is used as substitute for the fastenings such as the screw 36. The resilient clip 38 is of a similar profile to the free edge portions 22 and 24 arranged back to back and is configured so that it is biased inwardly to force the adjacent flanges 18 and 20
20 together. The resilient clip 38 is thus in profile generally C cross-shaped with its free edge portions flared outwardly for ease of clipping or mounting about the free edge portions 22 and 24 of the adjacent flange s18 and 20 respectively.

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Conventional metal decking members are generally of an asymmetric configuration wherein opposing flanges are turned inward and outward respectively. Thus, the conventional metal decking is formed by overlapping
30 adjacent flanges. The tendency for conventional metal decking is to fail under load wherein the adjacent overlapping flanges collapse or rotate toward the web of

one of the decking members. It is understood that the abutting flanges of adjacent metal decking members of this embodiment of the invention are less vulnerable to failure in this manner.

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Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described. For example, the C cross-section profile of the decking members may vary provided the metal decking member is longitudinally and/or transversely pre-cambered inwardly of the metal decking. The metal decking member in an alternative embodiment may be of the type commercially available in Australia under the trade mark BONDEK having one or more upstanding and longitudinally extending ribs. In this embodiment the web together with the upstanding ribs are precambered inwardly of the metal decking member. All such variations and modifications are to be considered within the scope of the present invention the nature of which is to be determined from the foregoing description.

In the preceding summary of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprising" is used in the sense of "including", that is the features specified may be associated with further features in various embodiments of the invention.

THE CLAIMS:

1. A metal decking member for use in a composite
5 structure, the member being elongate and of a
C cross-section profile comprising a web and a pair of
flanges extending from opposite longitudinal edges of the
web, in use the member being connected to an adjacent said
member so that said connected members form metal decking,
10 wherein the web is longitudinally pre-cambered inwardly of
the metal decking member so as to reduce outward
deflection of said metal decking member when casting
concrete on said decking.
- 15 2. A metal decking member as defined in claim 1, wherein
the web together with the opposing flanges are
longitudinally pre-cambered.
3. A metal decking member as defined in claim 1 or 2,
20 also comprising transverse corrugations cold roll formed
in the web.
4. A metal decking member being elongate and of a
C cross-section profile comprising a web and a pair of
25 flanges extending from opposite longitudinal edges of the
web, the web incorporating transverse corrugations cold
roll formed in the web, said corrugations inducing a
longitudinal pre-camber in said web which is directed
inwardly of the decking member.
- 30 5. A metal decking member as defined in claim 4, wherein
the web together with the opposing flanges are
longitudinally pre-cambered.

6. A metal decking member being elongate and of C cross-section profile comprising a web and a pair of flanges extending from opposite longitudinal edges of the web, each flange including a first part upstanding from the web, and a second part extending from an upper margin of the first part, the second part extending inwardly from the first part so as to be disposed over said web, wherein the web is longitudinally pre-cambered inwardly of the metal decking member.

7. A metal decking member as defined to claim 6, wherein the web together with the opposing flanges are longitudinally pre-cambered.

8. A metal decking member as defined in claim 6 or 7, also comprising transverse corrugations cold roll formed in the web.

9. A metal decking member as defined in any one of claims 6 to 8, wherein each second part extends generally parallel to the web.

10. A metal decking member as defined in any one of claims 6 to 9, wherein the second part of the flanges lie substantially in a common plane.

11. A metal decking member as defined in any one of claims 6 to 10, wherein each second part includes a lip at its distal end which is turned out of the plane of the second part to which it is associated.

12. A metal decking member as defined in any one of claims 3, 4 or 8, wherein the transverse corrugations are relatively light.

5 13. A metal decking member as defined in any one of the preceding claims, wherein the longitudinal pre-camber is up to about 2% measured as the maximum longitudinal offset of the web from a substantially flat plane and expressed as a percentage relative to the length of the web.

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14. A metal decking member as defined in claim 13, wherein the longitudinal pre-camber is between about 0.4% to 1%.

15 15. A metal decking member as defined in any one of the preceding claims, wherein the web in transverse section is pre-cambered inwardly of the metal decking member.

16. A metal decking member as defined in claim 15,
20 wherein the transverse pre-camber is up to about 5% measured as the maximum offset of the web from a substantially flat plane and expressed as a percentage relative to the width of the web.

25 17. A metal decking member as defined in claim 15, wherein the transverse pre-camber is between about 1% to 4%.

18. A metal decking member for use in a composite
30 structure, the member being elongate and of a C cross-section profile comprising a web and a pair of flanges extending from opposite longitudinal edges of the web, each flange of the member being adapted to be

connected to the flange of another said member so that said connected members form metal decking, wherein the web in transverse section is pre-cambered inwardly of the metal decking so as to reduce outward deflection of said metal decking when casting concrete on said decking.

19. A metal decking member being elongate and of a C cross-section profile comprising a web and a pair of flanges extending from opposite longitudinal edges of the web, each flange comprising a first part upstanding from the web, and a second part extending from an upper margin of the first part, the second part extending inwardly from the first part so as to be disposed over said web, and wherein the web in transverse section is pre-cambered inwardly of the metal decking.

20. A metal decking member as defined in claim 19, wherein each second part extends generally parallel to the web.

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21. A metal decking member as defined in either claim 19 or 20, wherein the second part of the flanges lie substantially in a common plane.

22. A metal decking member as defined in any one of claims 19 to 21, wherein each second part includes a lip at its distal end which is turned out of the plane of the second part to which it is associated.

23. A metal decking member as defined in any one of claims 18 to 22, wherein the transverse pre-camber is up to about 5% measured as the maximum offset of the web from

a substantially flat plane and expressed as a percentage relative to the width of the web.

24. A metal decking member as defined in any one of
5 claims 18 to 22, wherein the transverse pre-camber is between about 1% to 4%.

25. A metal decking member as defined in any one of the preceding claims, wherein the pair of opposing flanges are
10 disposed symmetrically either side of an imaginary longitudinal axis of the metal decking member.

26. A metal decking member as defined in claim 25, wherein the C cross-section profile of the metal decking
15 member is substantially symmetrical.

27. A metal decking member as defined in any one of the preceding claims, wherein the flanges each include a longitudinally extending rib.
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28. A metal decking member as defined in claim 27, wherein the ribs are shaped complementary to and aligned with one another, one of the ribs protruding outwardly and the other of said ribs protruding inwardly whereby
25 adjacent ribs of adjacent decking members nest within one another.

29. Metal decking including a plurality of metal decking members as defined in any one of the preceding claims,
30 wherein said members are connected together and are arranged alongside one another so that flanges of adjacent decking members abut.

30. Metal decking as defined in claim 29, wherein adjacent ones of the plurality of decking members are secured together via fixing means.

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31. Metal decking as defined in claim 30, wherein said fixing means includes one or more fasteners designed to engage adjacent flanges of adjacent decking members.

10 32. Metal decking as defined in claim 30, wherein said fixing means includes a resilient clip configured to releasably engage free edge portions of adjacent flanges of adjacent decking members.

15 33. A composite structure comprising a concrete slab and metal decking as defined in any one of claims 29 to 32 which is clad or embedded in said slab.

20 34. A method of forming a metal decking member being elongate and of a C cross-section profile comprising a web and a pair of opposing flanges, said method involving roll forming transversely oriented corrugations in at least part of the web whereby the web is longitudinally pre-cambered inwardly of the metal decking member.

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35. A method of forming a metal decking member as defined in claim 34, wherein the transverse corrugations are cold roll formed in the web.

30 36. A method of forming a metal decking member as defined in either claim 34 or 35, wherein the transverse corrugations are relatively light.

37. A method of forming a metal decking member in any one of claims 34 to 36, wherein the metal decking member is cold roll formed.