

REINFORCEMENT GRID ARRAY FOR REINFORCED CONCRETE

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The invention relates to reinforcement grid arrays for reinforced concrete, and the grids of which consist of longitudinal and transverse members crossing one another and connected, preferably welded, together at the points of intersection.

10 The construction of planar reinforcements out of grids of this kind is burdened with certain problems. On the one hand the reinforcement must be adapted as well as possible to the great variety of structural units having different dimensions and different cross-sections of steel necessary, specific to the unit of width. On the other hand, as regards the economy of manufacture and the keeping of stock, the number of the types of grid mats offered for sale and which differ from one another as regards their outer dimensions as well as regards the spacings and diameters of the wires employed, must be kept as small as possible.

20 The maximum width of commercial grid mats is, mainly for reasons of transport, restricted (e.g., in Austria to 2.40m and in Germany to 2.15m). It follows from that, that predetermined structural members, for example, the panels of slab ceilings in building construction can be reinforced only in the way that a number of grid mats the length of which is adequate for spanning the predetermined structural members in one direction, are laid side by side so that also in the direction perpendicular to them continuous reinforcement

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is obtained in the structural member which is to be reinforced. In this kind of reinforcement, in order to secure the transmission of the forces prevailing in the structural member in the direction of the

5. transverse wires of the grids, the adjoining edges of adjacent mats must overlap one another by a number of meshes or points of weld which are usually prescribed according to standards (e.g., in Austria and Germany for so-called "distributor joints" in the case of
10. uniaxially reinforced structural members by one mesh and for so-called "bearer joints" in the case of slabs reinforced biaxially, by three meshes).

From this there results a further problem. That is, if the longitudinal wires of the grids are distributed

15. at equal mutual spacings across the width of the grid, in the region of overlap of the grids a congestion of wires occurs which hitherto was usually put up with as an unavoidable loss of material.

- In order to obviate this defect, however, special
20. grids, so-called "edge economy grids" have already been developed (see British Patent No. 204,497, West German O/S 1,609,846), which are made in such a way that they exhibit voids in the longitudinal wires at the edges of the grids, which upon laying of the grids with
 25. overlapping of the edges are filled by longitudinal wires of the neighbouring grids so that in each case a definite specific cross-section of steel characteristic of a given type of grid is obtained with at least approximately uniform distribution of the longitudinal wires within the
 30. whole reinforcement. One advantage of these edge economy grids consists in the fact that their correct laying in the structure may easily be checked merely by eye, since in the case of correct laying all of the wires must lie throughout at equal mutual spacings. To the solution of
 35. the problem of enabling as good an adaptation as possible of the reinforcement to predetermined requirements, with the smallest possible number of types of grid these economy

grids, however, make no contribution.

- On the other hand the practice is known, in laying regular grids, the longitudinal and transverse wires of which having each the same diameter as one another
5. and the same mutual spacings, with overlapping of the edges of adjacent mats, that the accumulations of steel resulting in the overlapping zones may in the case of mats which are not far too wide, be considered as distributed uniformly over the whole width of the
10. reinforced structural member. The specific cross-section of steel actually existing in the structural member may therefore, as compared with the specific cross-section of steel of the individual grids, be increased within wide limits arbitrarily and almost continuously by
15. widening these overlapping zones.

- This method of laying grids in principle allows, with a relatively small number of types of grid, very good adaptation of the specific cross-section of steel existing in the reinforced structural member to the
20. specific cross-section of steel actually necessary. Also, a very good adaptation of the reinforcements of the grids to the different widths of the structural members can be achieved. However, for economic success and for the preservation of the necessary safety this way of laying
25. presupposes that first of all it is determined in the site office which types of grid and which widths of overlap of the edges of the grids are necessary to achieve the most favourable results, and furthermore, that the necessary widths of overlap are specified on the laying
30. plans and that finally these dimensions are exactly maintained on site and can still be checked after laying of the reinforcement has been effected. In particular however the latter prerequisites cannot be fulfilled with the regular grid mats, because in the case of the plurality
35. of grid wires crossing over one another, particularly when there are cross-grids, the start and end of one grid

or the width of overlap of adjacent grids can scarcely still be recognized because of the uniformity of all of the grid wires.

5 The problem of the invention is therefore to construct reinforcement grid arrays in such a way that they may be laid with a number of different edge overlappings which can easily be checked visually, in order, in particular with a predetermined number of types of mat, to achieve, as compared with the way
10 hitherto usual laying of regular grids and so-called edge economy grids, an increased possibility of variation of the specific cross-section of steel, or to be able to realize a predetermined number of steps of specific cross-sections of steel with a smaller
15 number of types of grid. Naturally there then exists also the possibility of varying both the number of steps of specific cross-section of steel and also the number of types of grid as compared with standard programmes for regular grids.

20 This problem described is solved in accordance with the invention by an array of reinforcement grids for reinforced concrete, each grid consisting of longitudinal and transverse members crossing one another and connected at their points of
25 intersection, wherein at least one edge of each grid there are arranged, at equal mutual spacings exceeding the mutual spacings of the longitudinal members in the middle region of the grid, a number of edge longitudinal members which are distinguished to
30 the naked eye from the longitudinal members in the middle region, at least one of the edge longitudinal members being clearly distinguishable to the naked eye from the other edge longitudinal members over its whole length, adjacent grids being positioned with a
35 number of edge members in overlapping relationship and the arrangement being such that there is a pattern of overlap clearly distinguishable to the

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case of overlap with an accumulation of steel which can be taken into account in the region of overlap even in the case of biaxial reinforcements, there are clearly distinguishable pictures of the overlap, so that a purely

5. visual checking of position of the laid grids is possible without the assistance of measuring apparatus, as will be explained more closely later.

- The mutual spacings of the edge longitudinal members should amount preferably to 1.5 to 2 times the spacings
10. of the longitudinal wires in the middle region so that on the one hand the edge rows of the grid may be distinguished with adequate clarity by the greater inside width, but on the other hand the maximum permissible mesh width usually prescribed according to the standards with
15. respect to the individual loading, is not exceeded.

- Advantageously the majority of the edge longitudinal members each consist of two parallel wires arranged at a distance apart and at least one longitudinal member, preferably the innermost, consists of longitudinal
20. wires lying closely side by side or of a single wire of larger diameter than the wires of the other longitudinal members and the inner longitudinal wires of the mat. Through the preferred employment of two parallel wires arranged at a distance apart for the outer longitudinal
25. members a particularly good anchoring of these edge members in the concrete is ensured, because concrete can penetrate between the two parallel wires of each member. The employment of wires lying close together or of a thicker wire for the innermost longitudinal member at each
30. edge of the mat on the other hand throws more clearly into relief the inner boundary meshes at the edges of the mat.

- Alternatively, the distinguishability of one longitudinal member from the rest is achieved by marker members
35. distributed at intervals along its longitudinal extent.

The marker members may be made as cross-connectors, e.g., metal straps, bridging across the gap between two parallel wires arranged at a distance apart, as marking deformations in the transverse members in the region of intersection with one of the edge longitudinal members or as plastics sleeves of different colours, arranged at intervals along the respective edge longitudinal members.

Through the arrangement of such marker members at regular intervals which are not too large, for example of 1m each, it is ensured that the edge longitudinal members even after severance of a grid into a number of parts, remain clearly recognizable and distinguishable on each of the sections of grid so obtained.

The marker members also offer the possibility of imprinting in them a designation for the type of grid. Hitherto reinforcement grids have in general been characterized by labels connected to the grid at one or both ends of the grid by binding-wire. Apart from the fact that these labels already during handling of the grid may easily be torn off, upon severance of a grid into a number of sections (which is very frequently necessary on site), sections of grid get left without type designation. Identification of sections of that kind as regards the type of grid is then possible only through time-wasting re-measuring of the wire diameter with calipers.

Examples of grid arrays according to the invention will now be described with reference to the accompanying drawing in which:-

Figure 1 shows a reinforcement grid having three edge rows of apertures of greater inside width at each edge of the grid;

Figure 2 is a cross-section through the lefthand edge region of the grid of Figure 1, on a larger

scale;

Figures 3, 4 and 5 show arrays with lap joints of two adjacent grids of the Figure 1 type in which respectively one, two

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or all three longitudinal members of each grid engage in the outermost row or rows respectively;

Figure 6 is a plan of a second grid type;

Figures 7 and 8 is, on a larger scale, the plan of a marker member on a pair of wires at the edge this grid;

Figure 9 is a plan of a further grid type;

Figure 10 is, on a larger scale, a plan of the point of cross of a transverse wire with two longitudinal members at an edge of this grid;

Figure 11 is the plan of a fourth grid type; and

Figure 12 is, on a larger scale, a marker member for the longitudinal member at the edge of it.

In the middle region of the grid shown in Figures 1 and 2 the longitudinal wires are arranged at equal mutual spacings a . In the two edge regions of the grid there are arranged at greater mutual spacings k_a from one another and from the outermost longitudinal wire respectively of the middle region of the grid, three longitudinal members in the form of pairs of wires 2, 3 and 4, all of the wires running in the longitudinal direction being connected, preferably welded, by transverse wires 5. The factor k as already mentioned lies advantageously between 1.5 and 2.0. There results therefore at each edge region of the grid three rows of apertures which have a clearly greater inside width than the normal apertures in the middle region of the grid.

The innermost pair of wires 2 at each edge is formed out of two wires 2a, 2b touching one another, whereas the outer pairs of wires 3 and 4 in each edge region are formed from two wires 3a, 3b and 4a, 4b respectively which are arranged at a small distance e apart which may be big enough for the two wires of the pair of wires in question to be completely enveloped in concrete and anchored in it. According to the standards valid in Austria this distance would, for example, have to be equal to twice the diameter of the wire and amount to at least 20mm.

Figure 3 shows the edge regions of two adjacent grids which overlap one another in such a way that in each case the outermost edge row is filled by the pair of wires 4 of the neighbouring grid. In this form of laying there remains between the pair of wires 2 and the adjacent pair of wires 3 one free edge row clearly characterizing this form of laying, or respectively there remain between the lap joint and the middle region of the mat two edge rows still free which are likewise characteristic of this form of laying.

In the form of laying shown in Figure 4 in which the two outer edge rows of each grid are filled by pairs of wires 3 and 4 respectively of the respective neighbouring grid, there still remains one free edge row between the pair of wires 2 and the longitudinal wire 1 of the middle region of the grid lying next to it.

Finally on the form of laying as in Figure 5, all three edge rows of the one grid are filled by pairs of wires 2, 3 and 4 respectively of the neighbouring grid.

As Figures 3 to 5 reveal, the individual forms of laying which differ from one another as regards the specific cross-section of steel and the width of the area which is to be reinforced, can clearly be distinguished visually from one another in each case.

In the case of the reinforcement grid shown in Figure 6, the main part of which consists of longitudinal wires 1 and transverse wires 5 welded together at the points of cross, the edge longitudinal members 2 are made as pairs of wires with individual wires lying directly side by side and the edge longitudinal members 3 and 4 are made as pairs of wires with individual wires arranged at a distance apart, where the distance between the individual wires of each pair of wires is chosen to be big enough for each individual wire to be fully enveloped with concrete. Hence the distance between the individual wires of each pair is considerably smaller than the distance between the individual wires 1 in the

inner region of the grid and thereby considerably smaller than the mutual spacing of the edge longitudinal members 2, 3 and 4 from one another and preferably lies in the range between 20 and 50mm.

5. Between the parallel individual wires of the edge longitudinal member 4 as shown in Figures 7 and 8 on a larger scale, metal straps 6 are welded to bridge across the gap, and in accordance with Figure 7 may if necessary also carry an inscription designating the type of mat.
10. The grid shown in Figure 9 exhibits again in its inner region single longitudinal wires 1 whilst at each edge of the grid at a greater mutual spacing than the longitudinal wires 1 there are arranged longitudinal members 7 and 8 distinguishable from them and from
15. one another. Just like the longitudinal wires 1 they are welded at their points of cross to the transverse wires 5. The longitudinal members 7 and 8 again consist of pairs of individual wires arranged at a distance apart from one another. In order to enable these
20. longitudinal members to be distinguished clearly in the laid state of the mats, the transverse wires 5 as clearly shown in Figure 10, are bent in a wave at 9 between the two individual wires of the pair of wires 7, whereas between the two individual wires of the pair
25. of wires 8 they run straight. The particular advantage of these distinguishing features lies in the fact that they may be achieved with simple additional devices in combination with conventional grid-welding machines.

- Figure 11 shows a reinforcement grid which again
30. is built up from longitudinal wires 1 in the interior of the mat, edge longitudinal members 2, 3, 4 and transverse wires 5. The edge longitudinal members 2 to 4, made in this embodiment as single wires, are characterized distinguishably from one another and from
35. the longitudinal wires 1 in the inner region of the grid by marker members arranged at regular intervals and designated in general by 10a, 10b, 10c.

Figure 12 shows a possible construction of the marker members as plastics sleeves 10 of different colours having an impression which designates the type of grid. For example, as is usual in Austria, mats

5. having completely definite axial spacings of the longitudinal and transverse members may be characterized by a code letter (in the embodiment: "A"), whilst the number (in the embodiment: "38") might specify the diameter of the longitudinal rods in 1/10mm. For
10. distinguishing them the marker members 10 may be coloured, e.g., on the edge longitudinal member 4 red, that on the edge longitudinal member 3 yellow and finally that on the longitudinal member 2 green. Such coloured marker members can be very clearly recognized even in the
15. laid formation of mats.

- The examples described may be modified in diverse ways within the scope of the invention. Thus in each edge region of the grid more than three edge rows of greater inside width may be provided, and the difference
20. between the longitudinal members in the edge regions and the longitudinal wires in the regular middle region of the mat may also be achieved in other ways, say, by larger wire diameters and/or construction of at least some of these longitudinal members as ribbed or twisted
25. rods.

- For the avoidance of material losses at the ends, of the structural member which is to be reinforced, residual grids may be employed in a manner known in itself, which are obtained by dividing up on site normal
30. grids, or for the same purpose part-mats of smaller width, e.g., half width, may be manufactured, which exhibit only on one side edge rows of greater inside width formed by distinguishable longitudinal members.



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CLAIMS

1. An array of reinforcement grids for reinforced concrete, each grid consisting of longitudinal and transverse members crossing one another and connected at their points of intersection, wherein at at least one edge of each grid there are arranged, at equal mutual spacings exceeding the mutual spacings of the longitudinal members in the middle region of the grid, a number of edge longitudinal members which are distinguished to the naked eye from the longitudinal members in the middle region, at least one of the edge longitudinal members being clearly distinguishable to the naked eye from the other edge longitudinal members over its whole length, adjacent grids being positioned with a number of edge members in overlapping relationship and the arrangement being such that there is a pattern of overlap clearly distinguishable to the naked eye, dependant on and specific for the number of edge members overlapped.
2. An array according to claim 1, wherein edge longitudinal members which are distinguished from the longitudinal members in the middle region of each grid, and at least one of which is clearly distinguishable visually from the others, are provided on both sides of each grid.
3. An array according to claim 1 or 2, in which the mutual spacings of the edge longitudinal members are 1.5 to 2 times the mutual spacings of the longitudinal members in the middle region of each grid.
4. An array according to any of claim 1 to 3, in which the majority of the edge longitudinal members each consist of two parallel wires arranged at a

distance apart, and at least one edge longitudinal member consists of longitudinal wires substantially touching one another or of a single wire of larger diameter than the wires of the other edge longitudinal members and the inner longitudinal wires of each grid.

5. An array according to claim 4, wherein it is the innermost edge longitudinal member which consists of longitudinal wires lying closely side-by-side or of a single wire of larger diameter than the wires of the other edge longitudinal members and the inner longitudinal wires of each grid.

6. An array according to any of claims 1 to 5, in which the distinguishability of one edge longitudinal member from the others is achieved by marker members distributed at intervals along its length.

7. An array according to claim 6, in which the marker members are cross-connectors bridging across the gap between two parallel wires arranged at a distance apart.

8. An array according to claim 7, wherein the cross-connectors are metal straps.

9. An array according to claim 6, in which the marker members are provided by deformations in the transverse members at the region of intersection with an edge longitudinal member.

10. An array according to claim 6, in which the marker members are plastics sleeves of different colours, arranged at intervals along the respective edge longitudinal members.



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11. An array according to any of claims 6 to 10, in which each marker member is provided with a designation, characterizing the type of grid.

5 12. An array according to claim 1, substantially as described with reference to any of the examples shown in the accompanying drawings.

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