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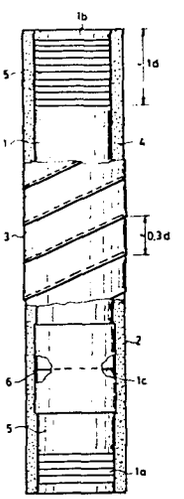
(54) Load-bearing mantle surface for bearing structures.

(57) The invention relates to a load-bearing mantle surface to bearing structures, in particular to columns, which can be characterized in that a simple or multi-layer glasscloth having been impregnated with an adhesive and wound on a crade made of paper or any other suitable material with a diameter being larger, than the diameter of the column or in case of a prismatic cross-section larger, than the longest edge thereof, is wound onto the column. Between the mantle surface and the glasscloth a granular material, e.g. sand, gravel or split is filled. On the lower end and the upper end of the column a complementary glasscloth is wound - eventually directly on the column - and optionally a splicing muff can be wound at the splicing points of the glasscloth having been wound onto the column.



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LOAD-BEARING MANTLE SURFACE FOR BEARING STRUCTURES

The invention relates to a load-bearing mantle surface for bearing structures, in particular columns.

In technical practice we are frequently confronted with the task, in so far as a combined bearing structure is to be formed which contains a mantle surface and an inner core arranged within said mantle surface. In the majority of the cases partially the requirement is to be met that mantle surface and the inner core should equally partake in load bearing. With these structures the necessary measures are to be taken that mantle surface and inner core should co-operate.

Theoretically there are two possibilities for creating co-operation. In the first case there is a machanic connection between the mantle surface and the inner core, in the second case there is a molecular connection. The advantage of the former solution lies in that connection establishing co-operation realizes transfer of forces on a large surface, accordingly proper distribution is obtained. With mechanical connections transfer of forces is taking place locally, while concentrated forwarding loads may result in unadvantageous local circumstances in certain cases.

Molecular connections are realized by welding or gluing. By welding transmission of large forces becomes possible, however, relatively few materials are suitable for welded connections. In addition, in course of in situ works welding can be performed mostly with difficulties only and not in the desired quality.

Welding cannot be performed with constructions made of stone, concrete or bricks. With these structures load-bearing mantle surface used to be formed so, that the existing bearing element, e.g. a column is enclosed by a jacket made of reinforced concrete. Experiments having been gained with these structures are disadvantageous, because co-operation between the original column functioning as an inner core and the reinforcing mantle is rather uncertain.

From this aspect the methode can be considered as more advantageous, in course of which along the edges of the bearing element, e.g. a column rods made of shapes are arranged which are interconnected by the lashes having been welded thereon. After having been cooled, the lashes are exerting a contracting force resulting in a transversal stress. Thereafter, applying the traditional method, the mantle is prepared by means of circumpositioned cradles, by guniting the concrete with a spray gun. This solution did not prove to be useful, as labour-and space requirement is too

high, at the same time wet technology /in-situ concreting/ is expressively disadvantageous at existing buildings, e.g. at falts.

In contrast to the aforementioned, a most reliable molecular bond can be achieved by gluing. The most developed form of this process is specified in the Hungarian Patent Specification No. 165,376. Inspite of the unquestionable advantages of the proposed method, several fields of application are unsuitable for this solution. So e.g. no pre-fabricated load-bearig elements can be produced by said process which could enable the separation of the mantle surface and the inner core when pulling down becomes necessary, i.e. repeated use of the single components. Said solution does not yield the possibility either to prepare a bearing element, e.g. a column assembled of several parts in such a manner, that parts could be spliced in a most reliable manner.

The GB-PS 1.603.252 /Michelin and Cie./ entitled "Reinforcement elements" relates to the reinforcement of concrete elements /columns/ by using a band with a fibrestructure and corrugated transversely in two directions. The main advantage of this solution lies in the proper adhesion to the concrete. Prior to hardening of the concrete, the band is applied. By using this solution, reinforcing effect

can be increased by 50%.

The US-PS 4.019.301 /Douglas I.Fox, "Corrosionresistant encasements for structural elements"/ discloses a casement for protecting steel, wooden or concrete pillars against corrosion and water. The corrosionresistant encasing is made of glassfibre or epoxy resin and it is closed by engaging tongue hooks along the generatrix. The space between the encasement and the pillar is filled with a filler, e.g. with concrete or epoxy resin.

The DE-OS 24 31 476 /Appl.: Firma Gebrüder Friedrich; Baustoffarmierung aus Heidelberger Vlies/ describes a mantle casement for reinforcement, of the form of a band or carpet made of synthetic fibre. Said casement is erosionresistant corrosionresistant, crackresistant, and permeable, by little demand on volume.

The DE-AS 27 63 858 /Herman Schemel: Verfahren zum Herstellen von faserbewehrten Betonformteilen und nach diesem Verfahren hergestellte Formteile/ describes a process, in course of which fibres are introduced into a fibrous cloth, e.g. a synthetic cloth having been impregnated with an adhesive substance, e.g. by blowing. Fibrous material adheses between the cloth, however, it is not oriented into the plane thereof. When making concrete profiles, the

cloth thus prepared is embedded into the concrete.

In the US-PS 3 798 867 /Benjamin F. Starling, "Structural method and apparatus"/ discloses a process for reinforcing columns, course of which the column is encased by a rigid jacket, e.g. made of steel, while the gap between the column and the encasement is filled with a binding material, expediently epoxy resin. Binding material penetrates into the cracks of the column and fills them.

The GB-PS 1 328 943 /Herbert C.Fischerm "Stressed elements and production thereof"/ describes a process, in course of which synthetic multi-filament strands are used for reinforcing roof-structures. These strands are composed of organic synthetic polymers, so nylon, polypropylene or polyesther and the filaments are either twisted or not.

Prior to use, the strands are pre-stressed by drawing, the extent of which lies in the range between 5% of the resting length and 80 to 90% of elasticity limit. First of all, a mantle is formed from the pre-stressed strands around the column, oriented in axial direction, thereafter, perpendicularly thereto, a bent bundle is formed along the periphery for the reinforcement of the column. Said solution does not serve exclusively for reinforcing architectural bearing structures, it is suitable for use on other fields too.

The common disadvantage of the enumerated solutions lies in that they are unsuitable for the simple and quick repair of extremly damaged columns.

The aim of the invention is to develop partly a load-bearing encasement, which can be separated from the inner core in case of necessity and can be repeatedly used, partly which enables the formation of a load-bearing structure assembled of several parts. A further task lies in to develop a bearing structure which is well suitable for reinforcing buildings on earthquake-endangerded places, as well as for the reconstruction of buildings or building-parts on areas afflicted by earthquake, in a reliable manner.

The invention is based on the recognition, in so far as, if the lower and upper end of the column are provided with a complementary winding, strength of the mantle surface can be considerably increased. A further possibility lies in that with extremly weak bearing structure between the inner surface of the cradle and the outher surface of the column a granular reinforcing material is filled, further increasing considerably the strength of the bearing structure. Deformation and crumbling of the bearing structure can be prevented by winding around with a glassfibrous band embedded in a synthetic material, whereby loadability of the structure can be increased. By the complementary reinforcement the ends of the column

may be formed as an elastic articulation, when a seismic effect is to be afraid of.

In accordance with the aim set the load-bearing mantle surface according to the invention for load-bearing structures, in particular for columns is formed so, that a simple or multilayer glass cloth having been impregnated with an adhesive and wound on a cradle made of paper or any other suitable material with a diameter being larger, than the diameter of the column or in case of a prismatic cross-section, larger than the longest edge thereof, is wound onto the column; between the mantle surface of the column and the glass cloth a granular material, e.g. sand, gravel or stonesplit is filled; on the lower and upper end of the column a complementary glass cloth is wound onto the column, optionally, a splicing muff can be wound at the splicing points of the glass cloth having been sound onto the column.

A further characteristic of the invention lies in that the width of the winding strips of the wound glass cloth amounts to at leats 30% of the diameter of the column or in case of a prismatic form, of the smallest edge of the cross-section of the prism.

In sense of a further characteristic of the invention the strips of the glass cloth are wound helically, with an overlapping of at least 1 cm, or

tangentially.

According to experiences it seems to be advantageous, if the length of the glasscloth wound onto the ends of the column for complementary purposes, measured in direction of the axis of the column corresponds at least to the diameter of the cylindrical column, or in case of a prismatic cross-section, to the length of the shortest edge.

With a preferred embodiment of the invention elements with a convex surface are fixed on the column surface, which are preferably embedded into swelling cement.

With a further preferred embodiment mortar, expediently some synthetic mortar is pressed below the cradling.

With a further preferred embodiment glass cloth is directly wound onto the column.

The advantages of the invention are, as follows:

- utmost quick performance;
- space-requirement is small, as well as in course of construction, as in the final position;
- limit of elastic behaviour is extended, accordingly on the reinforced column permanent deformations being characteristic for the concrete are reduced proportionally to the extent of reinforcement;

- by impregnating with a proper substance the glass-fibrous synthetic mantle can be rendered self-extinguishing from the aspect of fire protection.

A further advantage lies in that by using an inconsiderable material quantity transversal expansion is prevented up to the increased level of loadability and in case of a seismec effect ability for plastic deformation will be increased.

The invention will be described in details by means of a preferred embodiment, by the aid of the drawing enclosed, showing the vertical section of a column.

A cradle 2, e.g. made of paper, having a larger diameter, than that of the column 1 is placed onto the column 1. Between the column 1 and the cradle 2 we fill some granular material 4, e.g. gravel or sand. Onto the lower end 1a and the upper end 1b of the column 1 complementary glasscloth is wound, while in the whole length of the column 1 glasscloth having been impregnated with an adhesive is wound in one or more layers, in a stressed way. With the embodiment shown here at the splice 10 of the column 1 a splicing muff is used, which is provided with a complementary wounding.

A peripheric complementary wound is applied approximately perpendicularly to the longitudinal axis

of the column 1, arranged with an utmost small pitch, while by winding helically the glasscloth covering the whole surface of the bearing structure, complementary glasscloth having been wound on the ends 1a, 1b of the column 1 is fully covered.

Preferably complementary wounding with the glasscloth is made by using a material being identical with the glasscloth forming the mantle surface. Theoretically stripwidth of the glasscloth used for this purpose is of no importance, it seems, however, to be expedient, if the strips forming the complementary winding are forming overlapping wounds being in contact with one another. According to experience, the length of wound complementary glasscloth 3 applied on the ends 1a, 1b of the column 1, measured in axial direction, corresponds at least the diameter of the bearing element, or in case of a prismatic cross-section, at least to the shortest edge of the prism.

It is furtheron considered as advantageous, if in course of winding the glasscloth with a larger pitch forming the mantle surface, the width of the strips 3a of the glasscloth 3 corresponds at least to the 30% of the column diameter, or in case of a prismatic cross-section to the 30% of the shortest edge of the cross-section.

With load-bearing elements assembled of

several parts, single parts are interconnected by the splicing muffs 8, and in such a manner that the complementary glasscloth applied on the ends of the column should cover at least the length occupied by the splicing muff.

By using the proposed method it becomes possible to wind the glasscloth 3 impregnated with an adhesive around a cradle 2 made of paper or any other suitable - eventually unvaluable - material and thereafter to fill the cavity left free in the inside with some granular material, e.g. sand, gravel or split. In such a manner resistance to bending of the mantle surface - which can be considered quasi as a prefabricated column of glassfibrous material - is increased by the aid of the inner core. After dismantling the pre-fabricated mantle surface and the filled but not bound inner core can be separated from each other and used repeatedly.

The method according to the invention can be successfully used for reinforcing existing bearing structures, e.g. columns, -e.g. made of bauxite concrete -, for the repair and reconstruction of load-bearing structural elements damaged by fire or earthquake, the more, for achieving full load-ability of bearing structures made with an inconsiderable cement quantity and thus having ab ovo a reduced strength.

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What we claim is:

1. Load-bearing mantle surface to bearing structures, in particular for columns, c h a r a c - t e r i z e d in that a simple or multi-layer glass cloth /3/ having been impregnated with an adhesive and wound on a cradle /2/ made of paper or any other suitable material with a diameter being larger, than the diameter of the column /1/ or in case of a prismatic cross-section larger, than the longest edge thereof, is wound onto the column /1/, between the mantle surface and the glasscloth /3/ a granular material, e.g. sand, gravel or split is filled, furtheron, on the lower end /1a/ and the upper end /1b/ of the column /1/ a complementary glasscloth /5/ is wound and optionally a splicing muff /8/ can be wound at the splicing points /1c/ of the glasscloth having been wound onto the column /1/.

2. Mantle surface as claimed in claim 1, c h a r a c t e r i z e d in that the width of the strips /3a/ of the wound glasscloth /3/ amounts expediently to at least 30% of the diameter of the column /1/ or in case of a prismatic cross-section og the smallest edge of the cross-section.

3. Mantle surface as claimed in claim 1 and 2, c h a r a c t e r i z e d in that the strips /3a/ of the glasscloth /3/ are wound helically with

an overlapping of at least 1 cm or tangentially.

4. Mantle surface as claimed in claim 1, c h a r a c t e r i z e d in that the length of the glasscloth wound onto the ends /1a,1b/ of the column /1/ for complementary purposes measured in direction of the axis of the column /1/ corresponds at least to the diameter of the cylindrical column or in case of a prismatic cross-section, to the length of the shortest edge.

5. Mantle surface as claimed in any of the claims 1 to 4, c h a r a c t e r i z e d in that elements with a convex surface are fixed on the surface of the column /1/ which are preferably embedded into swelling cement.

6. Mantle surface as claimed in any of the claims 1 to 4, c h a r a c t e r i z e d in that mortar, expediently some synthetic mortar is pressed below the cradling /2/.

7. Mantle surface as claimed in any of the claims 1 to 4, c h a r a c t e r i z e d in that the glasscloth is wound directly onto the column /1/.

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