BEHAVIOUR OF INSULATION MATERIAL UNDER POINT LOAD AS PARAMETER FOR THE SAFE AND MECHANICAL MOUNTING OF SINGLE-LAYER POLYMER BITUMEN SHEETS.

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KEYWORDS:

Die Teilflächenbelastbarkeit nach EN 12430 ist die wesentliche Materialkenngröße zum Vergleich von Festigkeiten bei Dämmstoffen in Flachdachkonstruktionen.

ABSTRACTS:

Practice on construction sites over recent years has shown that a comparison of the strength of insulating material on flat roofs as defined by compressive strain in accordance with the standards can only be approximately correct. This value refers to loads per m^2. On the other hand on the construction site all introduction of strength only takes place in isolation on a partial surface, which either has a direct effect on assembly or in the application. Therefore the load capacity of the partial surface is the sole comparable parameter for the reliable, mechanical attachment of single layer lengths of Polymer bitumen.

Die Baustellenpraxis der letzten Jahre hat gezeigt, dass ein Vergleich der Festigkeiten von Dämmstoffen auf dem Flachdach durch die nach den Normen definierte Druckspannung nur annähernd richtig sein kann. Dieser Wert bezieht sich auf Belastungen pro m^2, wobei auf der Baustelle alle Krafteinleitungen nur punktuell auf einer Teilfläche stattfinden, die entweder bei der Montage oder bei der Anwendung direkt auf sie einwirken. Deshalb ist die Teilflächenbelastbarkeit die einzige vergleichbare Kenngröße für die sichere, mechanische Fixierung von einlagigen Polymerbitumenbahnen.

La pratica dei cantieri negli ultimi anni ha dimostrato, che un confronto delle resistenze di materiali isolanti sul tetto piano, a causa della sollecitazione di compressione definita dalla norme, può essere corretto solo approssimativamente. Questo valore si riferisce a carichi per m^2, sebbene sul cantiere tutte le

immissioni di forza abbiano luogo in modo puntuale su una superficie parziale, incidendovi direttamente durante il montaggio o durante l'impiego. Per questo motivo, la portata della superficie parziale è l'unico parametro confrontabile per il fissaggio sicuro e meccanico di superfici di bitume polimeri ad uno strato.

La pratique des chantiers durant les dernières années a montré que la comparaison de résistance des matériaux isolants sur toit plat sur la base de la tension de compression n'était qu'une approximation. Cette valeur s'applique aux charges au m^2 et il faut savoir que sur un chantier, la répartition des forces n'est pas concentrée sur un ou des points qui sont sollicités pendant le montage ou pendant l'utilisation. En conséquence, la résistance locale à la charge est la seule grandeur de comparaison pour la sécurité de fixation mécanique des bandes de bitume polymère une seule couche.

WRITER

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- since 1987 application technician for DEUTSCHE ROCKWOOL
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INTRODUCTION

The load capacity of pressure-resistant insulating materials has hitherto been described exclusively in terms of compressive strain. This is a value that only covers flat loads and so can really only be used for flat loads, e.g. gravel and roof landscaping.

In tests for compressive strain a sample is extensively deformed (i.e. compressed) at a fixed velocity. When a deformation of exactly 10% is reached, the force needed to reach this point is measured and converted to the test area. (Figure 1)

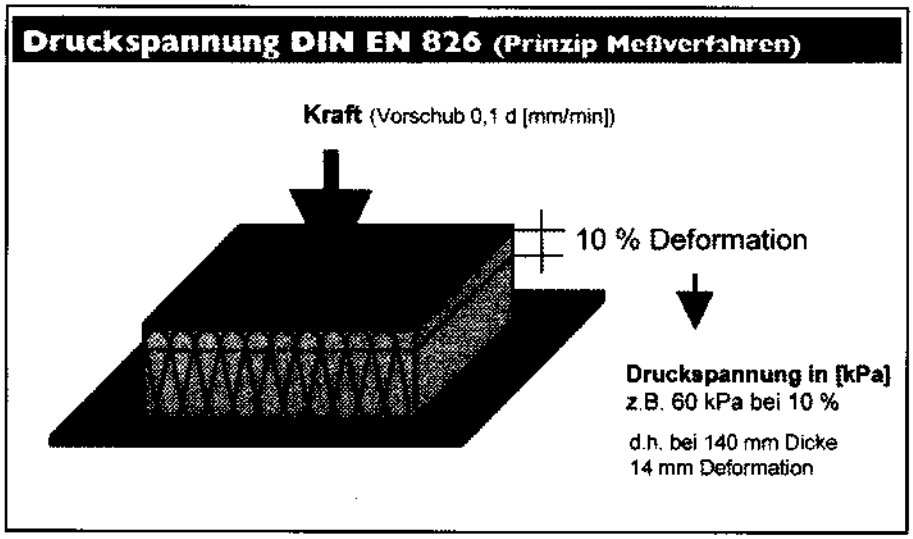

Figure 1: compressive strain DIN EN 826

THE PROBLEM

Experience of construction sites over recent years has shown that a comparison of the strength of insulating materials on flat roofs as defined by compressive strain in accordance with the standards can only be approximately correct. This value refers to loads per m^2, whereas on the construction site all introduction of force only takes place in isolation on a partial surface:

- dynamic, localised loads from the soles of workmen's shoes;
- dynamic load from wheels or rollers of transportation equipment;
- linear load from storage of materials on wooden planks;
- point load from scaffolding and ladders put up for subsequent work;
- point load from the load-distribution plate during mechanical attachment of single-layer lengths of sealing material. (Figure 2)

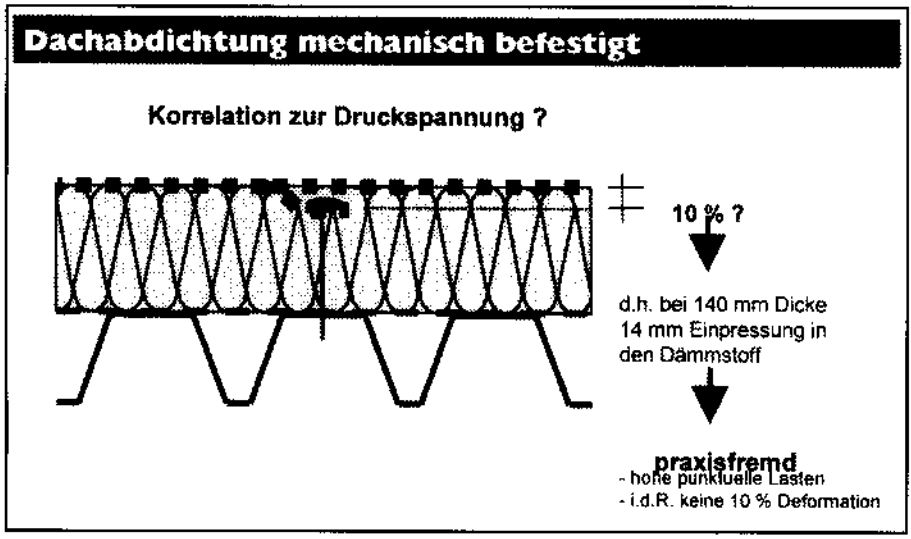

Figure 2: mechanical attachment of single-layer bituminous roof insulation

European standardisation has taken this actual situation into account and has set out the test regulations in DIN EN 12430: 'Ascertaining behaviour under point load'. (Figure 3)

For point load capacity, it is basically the toughness of the insulating material's surface that is measured. This is given in terms of the force needed to press a 50 cm^2 (79.8 mm diameter) die into the surface of the insulating material to a depth of 5 mm.

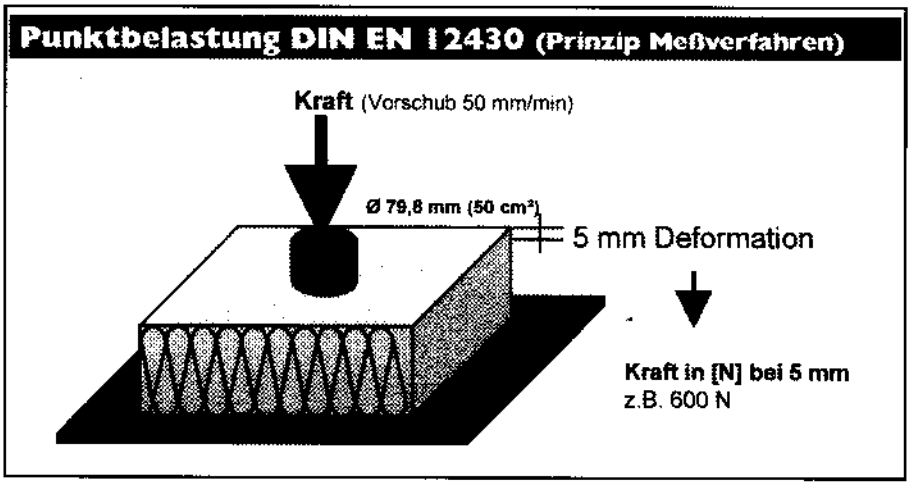

Figure 3: Point load capacity DIN EN 12430

This standard can be used to ascertain whether the products have sufficient strength to withstand loads – mainly caused by being walked on or being mechanically fastened – that directly affect them either during installation or in use.

Point loads, which are mostly dynamic loads, can lead to destruction of the fibre structure of 'soft' insulating materials. This leads to the loss of all mechanical product characteristics, such as compressive strain, point load capacity and tear-resistance. This means that, for the mechanical fastening of single-layer sealing systems, there is no longer any pressure between the retaining plate, the sheet of sealing material and the surface of the insulating material. Thus it is inevitable that the roof sheets will be torn at the screw shank of the fastening element and be pulled out from under the load-distribution plate.

SOLUTION

The problem described above results in the necessity, with mineral insulating materials, to increase the strength of the top layer in order to improve the point load capacity of the plates. This is done by compression, i.e. by raising the overall density in areas of approximately 220 kg/m3. This hard upper layer can be laid as a thin plate on the basic insulating material, or be integrated into the plate. (Figure 4)

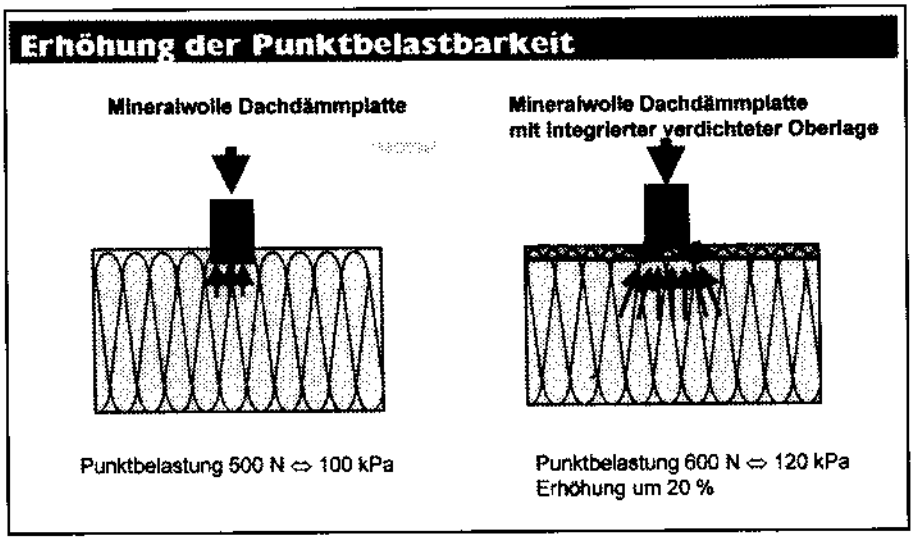

Figure 4: Increasing the point load capacity

CONCLUSION

The strength of the insulating material is of crucial importance to the durability of a mechanically mounted roof with a single-layer bituminous sealing. The higher the point load capacity of the surface of the insulating material, the more secure and thus durable the whole roof structure.