Fraunhofer Institut Materialfluss und Logistik

Final report No. 200845 on behalf of Sauerländer Spanplatten

Strength test of bearers consisting of tubular chipboards

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1 Initial situation and task

For more than fifty years the company Sauerländer Spanplatten GmbH & Co. KG, with headquarters in Arnsberg, has produced solid and tubular chipboards. In a special procedure these boards are produced as a continuous product, mainly for door panels. Tubular chipboards can be produced with different tube diameters and a different thickness what leads to different strengths.

These boards have a low grammage in line with a high pressure resistance.

Fig. 1: Tubular and solid chipboards

In addition to different sorts of door panels the company Sauerländer Spanplatten (SSP) has discovered other possible applications. For example, tubular chipboards are used to build so-called bearers with the dimensions 1150 x 50 x 70 mm (L x W x H), which are used as support for plasterboard packages. Several bearers are placed under the packages, which are several meters long and 1.20 m wide, and together with the plasterboard form a unit load, secured by a shrink foil. The stacks are moved and loaded among others by chain conveyors and stackers. Since they are stored in blocks 12 packages high the assumed load onto the single bearer is approx. 2,500 kg.

To get detailed data and information SSP charged an independent and neutral testing organisation to test their bearers regarding their strength and suitability.

2 Procedure

The packaging test laboratory of the Fraunhofer-Institut für Materialfluss und Logistik in Dortmund was ordered to test or prove the bearers by SSP regarding their strength and suitability for handling, storage and transport of plasterboard packages.

For this purpose, tests were made to determine the mechanical and statical characteristics of the SSP bearers under consideration of the transport, transhipment and storage conditions.

2.1 Determination of the strength

The compression strength of the bearers was determined with a 200 kN pressure tester. For this purpose, one bearer each was positioned between the pressure plates of the tester, which were then pressed together.

The pressure was increased until the bearers, generally the cavities, broke and/or until the force drastically dropped.

Prior to the test the bearers were climatised in a climatic chamber at a temperature of +23 °C and a relative humidity of 50%. They were submitted to the test immediately after they had been removed from the climatic chamber.

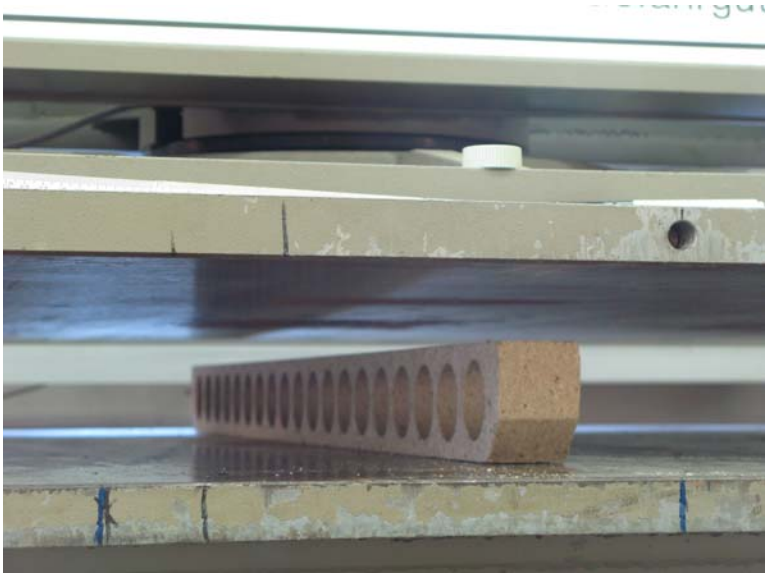


Fig. 2: Bearers in the pressure tester

Results

Fig. 3: Bearer under a breaking load of over 13,000 daN (cf. Real load in the stack approx. 2,500 daN max.)

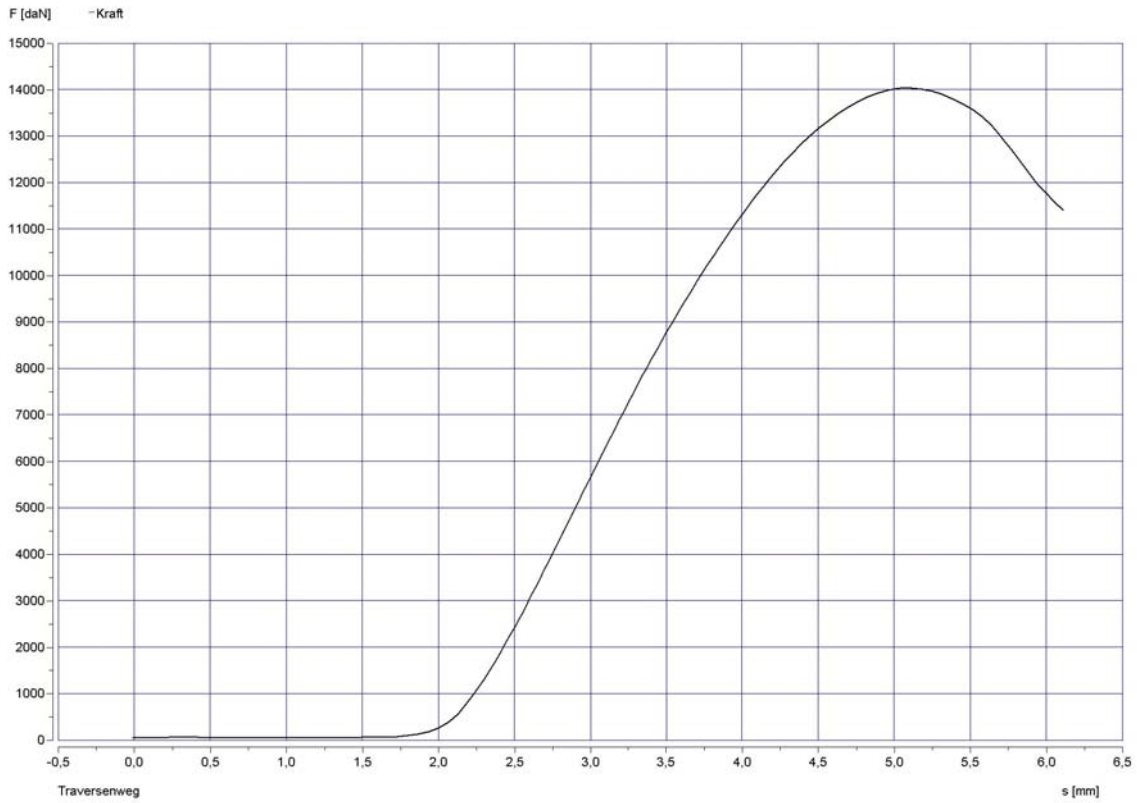
Fig. 4: Deformed bearer after the compression test with a breaking load of over 13,000 daN (cf. Real load in the stack approx. 2,500 daN max.)

The compression tests performed with bearers of Sauerland Spanplatten showed an average breaking load of 13,546 daN.

This corresponds to a breaking strength of approx. 14,110 kg per bearer.

Regarding the load of a single bearer of max. 2,500 kg in a plasterboard stack consisting of up to 12 plasterboard-packs, Sauerland Spanplatte fixed a necessary minimum loading capacity of 3,000 kg for a single bearer.

Given a real breaking strength of approx. 14,000 kg and the desired min. loading capacity of 3,000 kg this leads to a rupture safety of 4.6 when the bearer is stored or used under dry conditions.



Graph 1: Typical force-deflection graph during the compression test