

Professional Affairs

A METHOD FOR TESTING INTERNAL BOND OF PARTICLEBOARD

Constantine Passialis and George Tsoumis

Department of Forestry, School of Agriculture and Forestry,
Aristotelian University, Thessaloniki, Greece

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ABSTRACT

A circular sample is tested in shear by use of a hand dynamometer. The shearing position may be adjusted to test the bond within the sample thickness. Comparison of results shows a good correlation with standard testing.

Keywords: particleboard, internal bonding.

INTRODUCTION

Internal bond is an important property of particleboard, measuring the quality of bonding of its particles. According to American (ASTM 1972) and European (BSI 1969; DIN 1965) standards, this property is determined by testing a 5- × 5-cm sample glued between two metallic or wooden plates that translate a transverse tension load to the sample. The method measures the lowest strength within the sample, and may be applied to boards of any thickness, but it is slow and tedious and requires a testing machine to apply and determine the load at failure.

To overcome the disadvantages, other methods have been proposed. These methods are modifications of the standard (Lehmann 1965; Szabo and Gaudert 1978), or use samples of specific construction and apply *tension* (Buro and May 1960; Heebink and Gatchell 1965), *compression* (Kufner 1975; Suchsland 1977), *shear* (Noack and Schwab 1972), or *torsion* (Avale 1965; Shen and Carroll 1969; Shen 1970; Gertjansen and Haygreen 1971; Gaudert 1974). A "push-out test" (Grzeczynski and Bakowski 1963; Lehmann 1965) has also been used. Most of these methods have been reviewed by Kufner (1975).

The method proposed here is based on a shear test. The sample is circular and is removed with a small cylindrical saw. Testing is conducted by use of a hand dynamometer, while the sample is gripped in a wrench; the plane of test (shearing position) may be adjusted in relation to sample thickness. This allows testing at selected depths or the bond between layers (Fig. 1).

Circular samples present advantages in comparison to standard (rectangular) ones: they may be quickly extracted from any position of a board; the board is not cut off as in preparing standard samples; the sampling position (hole) may be refilled with a technique similar to that applied in production of veneer or plywood (removal of knots or other defects and refill of the holes).

Circular samples have been proposed by Avale (1965) and Heebink and Gatchell (1965), while other workers (Grzeczynski and Bakowski 1963; Lehmann 1965; Gaudert 1974) sawed into the board in a circular manner and conducted the test *in situ*. Avale (1965) glued the sample between two carrying plates as in the standard method, or used a nonglued sample gripped between two holders and

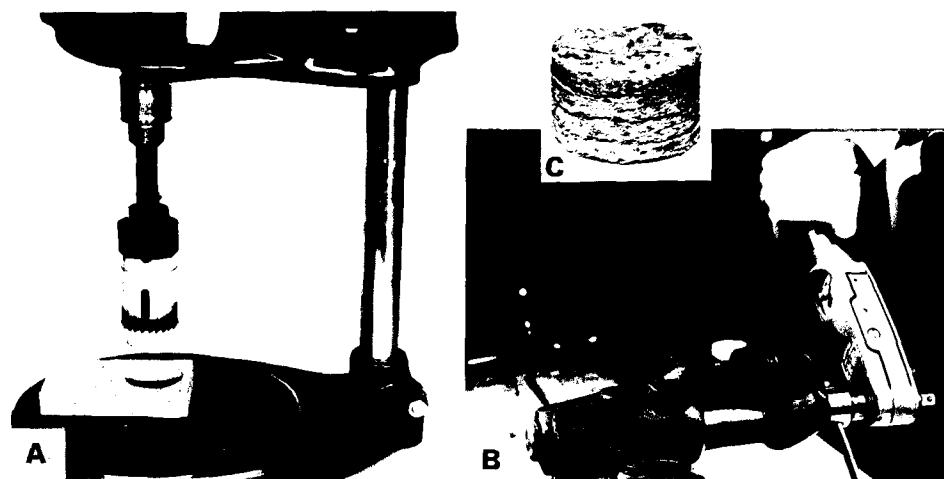


FIG. 1. Sample preparation and testing. A. Cylindrical sawing device holding a prepared sample above its extraction hole. B. Testing with a hand dynamometer (torque wrench). C. A sample after testing at three positions within its thickness.

applied torsion; the latter method was essentially the same in the proposal by Heebink and Gatchell (1965) with the difference that they applied tension. Grzeczynski and Bakowski (1963) and Lehmann (1965) made two circular (concentric and anisodiametric) but opposite sawcuts partially into the board and pressed from one side, and Gaudert (1974) sawed at selected depths and applied torsion with a specially designed dynamometer holding the sample with a connector block and four pins.

The present proposal, as described above, constitutes a simple and fast test.

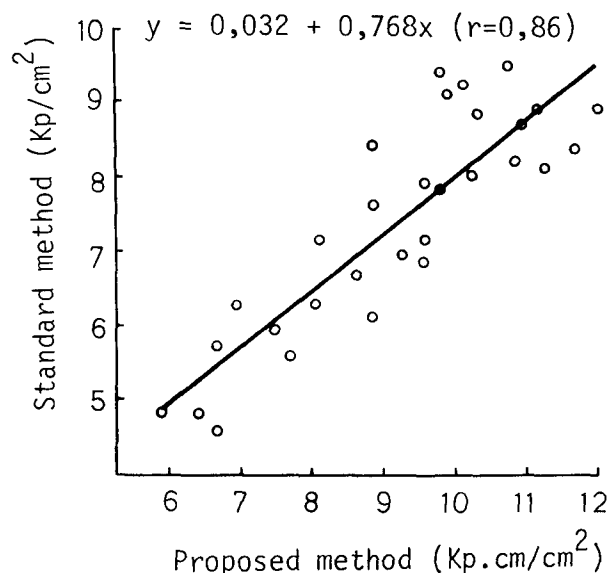


FIG. 2. Relationship of results obtained by testing with the proposed and the standard method.

EVALUATION OF THE METHOD

The proposed method was evaluated by comparing it with the standard (ASTM) method as follows: Both circular and rectangular (standard) samples were prepared from six commercial boards obtained (one each) from six different factories. All boards were 16 mm in nominal thickness. Each board supplied 5 circular and 5 rectangular samples, and each couple of one circular and one rectangular sample was taken from adjacent positions. Circular samples were prepared with 3.1 cm in diameter, while the rectangular ones had the standard 5×5 cm in dimension. The total number of tested samples was 60 (30 circular and 30 rectangular).

The results are shown in Fig. 2. The relationship of values obtained with the proposed and the standard method is linear with a coefficient of correlation $r = 0.86$.

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