Methods of Test of MDF

Density

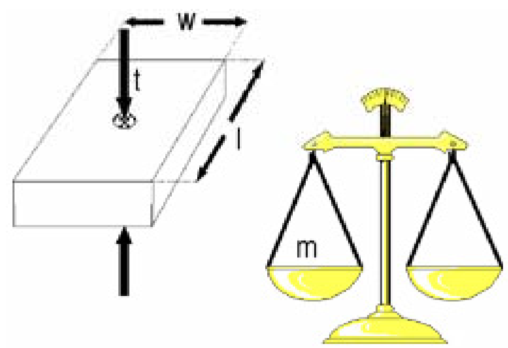
The density of a wood based sheet material is expressed as the weight in kilograms of a one cubic meter volume of board (kg/m3).

The density of any test piece is measured by reference to its weight and dimensions and the result calculated using a simple equation below:

$$\text{Density (kg/m3)} = \frac{\text{Mass (g)}}{\text{Length (Meter)} \times \text{Width (Meter)} \times \text{Thickness (mm)}}$$

Weighing few whole sheets on measuring scale and averaging the weight of each sheet is more reliable method than a small specimen, which may have inaccuracies in measurement of its area affecting the results.

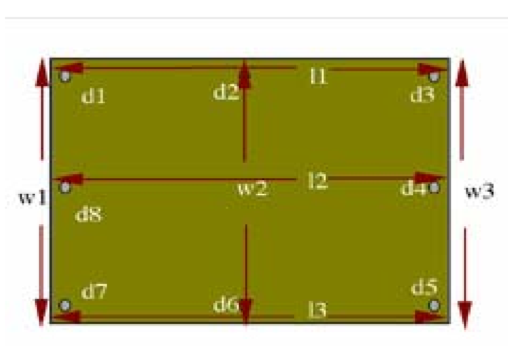
Changes in the moisture content in the Panel also affects the density for the losses or gain of moisture Ex-plant in transit or prolonged storage in conditions either too dry or too humid conditions.



Carter Holt Harvey checks average density and density profile, often using a highly sophisticated radiation scanning instrument, as part of their quality control procedures.

Thickness tolerance

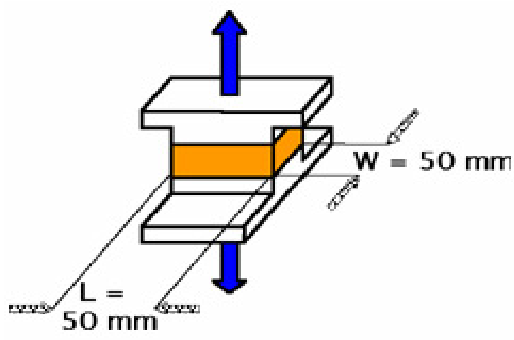
Any significant changes in moisture content during transit or storage can adversely affect the thickness tolerance of boards reaching the user. Correct storage conditions are necessary to protect the panels from variation in thickness owing to gain or losses in moisture content.



Internal Bond - Tensile strength perpendicular

Tensile strength perpendicular to the plane of the board, often described as internal bond, gives an indication of the resistance of a board to delamination or splitting. This property is measured by bonding two metal or wood holding blocks on either side of a 50mm x 50mm sample cut from the board. The prepared test piece is pulled apart in a tensile testing machine. The tensile strength is the force, in N/mm2 , required to split the test piece, failure normally occurring approximately along the centre line of the test piece.

This test which, perhaps more than any other, characterises MDF for interior applications, is widely used for quality control purposes.

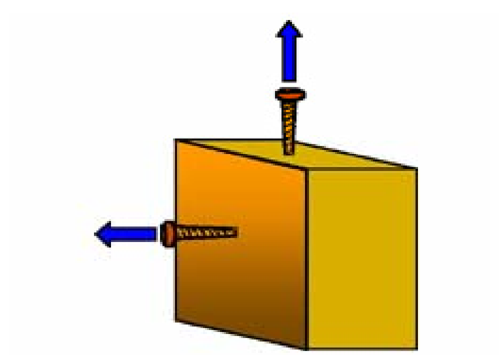


Note: Experience has shown that test specimen fixed with Hot melt often tends to affect the results. Epoxy at room temprature is considered to be the right kind of adhesive to fix the test specimen with grippers.

Screw holding

The ability to hold screws in both face and edges is an important attribute of MDF

Many different types and sizes of screws can be used in MDF but for the purpose of determining screw holding strengths, a 38 mm length, 4.2 mm diameter, parallel shank, steel screws with two start threads with pitch l.4mm (Gauge No. 8 in ISO 1478/1983) are inserted, where relevant, to a depth of 15 mm into predrilled pilot holes in the face and two edges of the MDF test piece. The resistance to axial withdrawal of these screws is measured using a tensile testing machine.



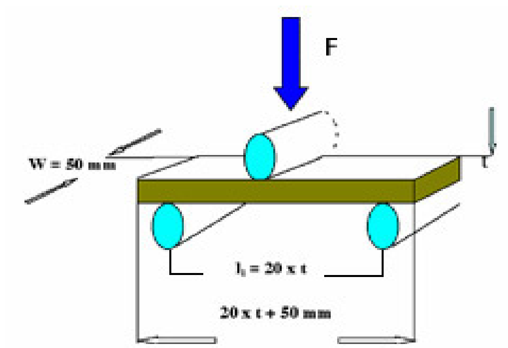
Whilst the diameter and depth of insertion of a screw will have a significant effect on the measured screw holding strength of MDF, small differences in thread form among commercially available screws would not be expected to have an effect on screw holding strength although some patented screws have advantages in production, for instance, ease of insertion.

Care need to be taken to ensure that the specimen for test evaluation is not drawn or made out of any damaged or dented sheet. Specimen for test need to be made from portion trimmed at least 25mm in depth of exposed edges of the whole sheet selected for preparation of specimen. Experiences have shown that errors in the corresponding size of pilot hole to the gauze of screw has often asffected the results in either being too loose or splitting the panel. The matrix for Screw size and corresponding pilot hole is provided in the section of 'Installation and pplication Guide'.

Bending strength and modulus of elasticity

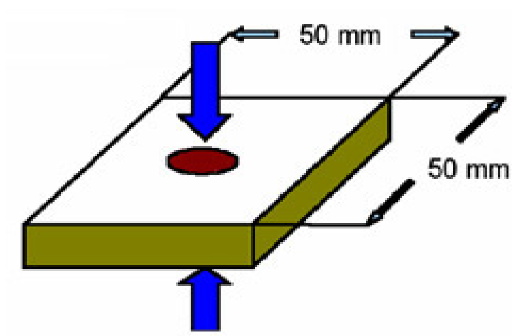
Both these properties are measured by supporting a 50 mm wide test piece on two parallel rollers spaced at a distance 20 times the thickness of the MDF and applying an increasing load through a third roller at the centre of the span. The modulus of elasticity is calculated from the deflection noted when the applied load has reached approximately one third of the failing load.

The bending strength is calculated from the failing load.



Swelling in thickness

The thickness swelling results from a water soak test give an indication of the response of the board to misuse involving intermittent wetting or exposure to extreme damp conditions for short periods. The swelling in thickness of a 50 mm x 50mm test piece during a 24 hours immersion in cold water is measured.



Dimensional stability

Dimensional stability is measured by noting the length, width and thickness of the test pieces after conditioning to constant mass at 35% rh, 25°C and after conditioning at 85% rh, 25°C. The dimensional stability is expressed as the sum of the percentage changes in each dimension between these limits.

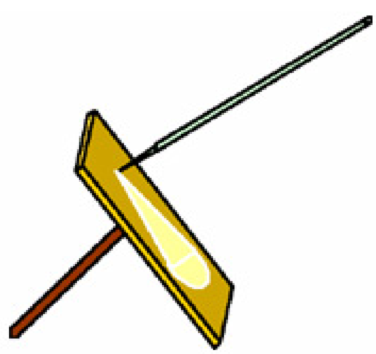
The lower limit of 35% rh, equivalent to an equilibrium moisture content of about 6% for MDF, represents the dry conditions associated with use in hot climates or in buildings with central heating. The upper limit of 85% rh, equivalent to about 13% moisture content, represents storage in a damp warehouse or the fitting out of components in a new building before the moisture has been dissipated from the building materials.

Grit content

The amount of grit in MDF is measured by reducing a weighed sample to ash by burning and then washing the ash in acid to dissolve any chemical salts. The incombustible, acid insoluble residue is thus the small grit particles in the panel.

Surface absorption (drop test)

Surface absorption is measured by allowing a measured amount of paint solvent to fall on the surface of a test panel supported at an angle of 60° to the horizontal and noting the length of board surface wetted before the toluene is absorbed. Boards with high surface absorption as indicated by a short length of wetting, will require higher paint coating weights to achieve a satisfactory paint finish.



Formaldehyde measurements

Many different methods are used to measure the amount of formaldehyde contained in or emitted from MDF manufactured with urea formaldehyde resin. While the governing standards define the type and method of tests, these methods can be divided into three groups and illustrated as follows:

Large chamber tests

Clean, formaldehyde free air at controlled temperature (typically 23°C) and relative humidity (typically 45% rh) is passed through a chamber containing a specified amount of board with its surface area of 1 Sq. Mtr and also related to the volume of the chamber which may vary from 12 m3 to about 40 m3. The concentration of formaldehyde in the chamber is measured twice a day by drawing approximately. 0.12 m^3 air from the chamber through gas washing bottles filled with absorption solution. The formaldehyde content of the aqueous solution is determined photo metrically or fluorimetrically by the acetyl acetone method. Sampling continues periodically until the formaldehyde concentration in the chamber reaches a steady-state The concentration of formaldehyde in the chamber is measured twice a day by drawing approximately. 0.12 m^3 air from the chamber through gas washing bottles filled with absorption solution. The formaldehyde content of the aqueous solution is determined photo metrically or fluorimetrically by the acetyl acetone method. Sampling continues periodically until the formaldehyde concentration in the chamber reaches a steady-state i.e. when the amount of formaldehyde emitted from the board surfaces is equal to the amount of formaldehyde removed from the chamber in the controlled flow air stream. This equilibrium concentration, measured in parts per million (ppm), is used as a means of defining the formaldehyde emission characteristics of the board being tested.

Care should be taken to deal the edges with any self adhesive aluminum tape to get a ratio U (unsealed area)/A (surface area) of 1.5m/$m^{2.}$ The air exchange rate in the chamber also need to be adjusted to 1 h 1^{-1} to ensure the relationship

The large size of the chamber and the long time to reach an equilibrium concentration makes this type of test unsuitable for day to day quality control purposes and of doubtful value for surfaced or coated boards, despite allowance for excessive emission.

Small scale chamber emission testing

Following the procedure involved in large chamber test, evaluation of formaldehyde emission is also done in small scale tests to measure the amount of formaldehyde emitted from the surfaces and edges of test pieces contained in small chambers.

In some, the equilibrium concentration, in parts per million (ppm) of formaldehyde, is measured, following the same principle adopted for the large chambers.

In others, the total amount of formaldehyde emitted into a controlled air stream in a specified time is measured with the result expressed as a true emission value per unit area of test piece (mg/m2/hour).

Desicator Test

In a third group of test methods within this general classification of small scale emission tests, the test piece is suspended over water in static air in an enclosed space. The amount of formaldehyde emitted from the test piece and absorbed by the water in a specified time is measured. Having regard for the significantly increased rate of emission of formaldehyde from boards in damp conditions, this method is also considered to have some limitations in accuracy of the results.

Perforator test method

The total extractable formaldehyde content of MDF is measured using the perforator method.

For this test, approximately 500 g of board, cut into small pieces, is boiled in toluene in a special set of laboratory glassware. The toluene absorbs the formaldehyde contained in the board pieces. It, in turn, is washed with water and the amount of formaldehyde originally contained in the board sample but now in solution in the water, is determined by chemical analysis using a colourimetric method.

The results are expressed as milligrams of formaldehyde in 100 grams of board (mg/100g).