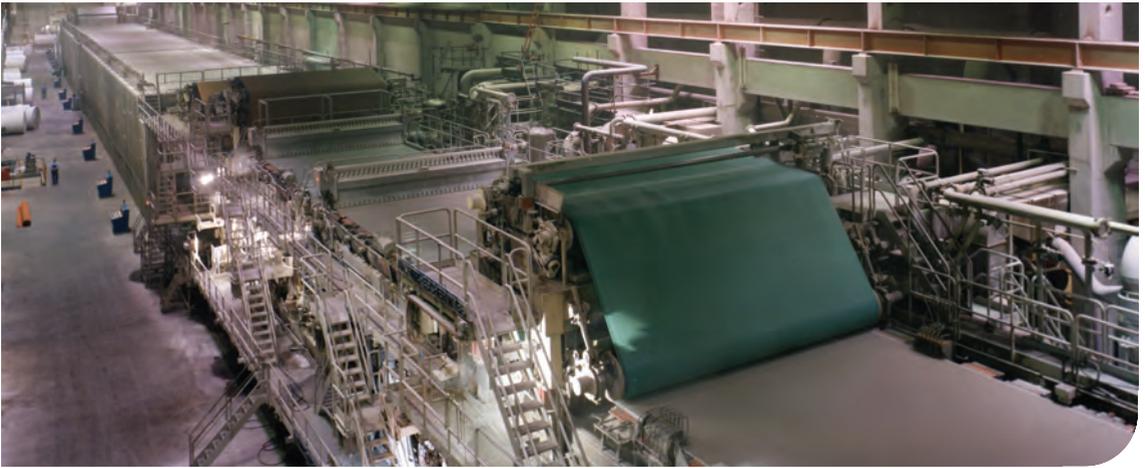


CARTONBOARD

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KEY FACTS

Cartonboard is a multilayered material. The main types of cartonboard are solid bleached board, solid unbleached board, folding boxboard and white lined chipboard. Cartonboard usually has a white, pigmented coating on one or both surfaces



Cartonboard specifications vary with respect to the pulp composition of the various layers and by the grammage (weight per sq. metre in grammes) and thickness (microns or 0.001 millimetre)

Cartonboard can be combined with other materials to vary the visual appearance and to extend the protective properties

Laminations, coatings and impregnations can be added to extend the range of carton applications



CARTONBOARD



Different types and grades of cartonboard and their abbreviations. The principles of cartonboard manufacture, developments and treatments

What is cartonboard?

Cartonboard is a multilayer material with, usually, three or more layers, or plies, of cellulose fibre (pulp) derived from wood. The various layers are combined in the wet state on the board machine and may comprise one or several different types of pulp.

The top layer of cartonboard usually has a smooth white pigmented coating based on china clay and/or calcium carbonate. The reverse side may also be coated or it may be white, brown, cream or grey in colour depending on the grade of fibre used.

How is cartonboard classified?

Papers and boards are classified by their fibre composition, the processing, manufacture and treatment at the mill, by grammage and thickness. Grammage is the weight of a square metre in grammes (g/m^2) and thickness is measured in microns (μm), that is, 1000ths of a millimetre.

The crossover point between paper and board is normally considered to be around $160\text{g}/\text{m}^2$ as it is only at this level that a fibrous material is likely to be stiff and rigid enough to make a container. Most folding cartons are in

the range $200\text{--}600\text{g}/\text{m}^2$ for grammage and $350\text{--}800\mu\text{m}$ for thickness.

What are the main characteristics of cartonboard?

Cartonboard is mechanically strong. Its stiffness, rigidity and toughness provide compression strength to protect products in distribution and use. It can be cut, creased, folded and glued, giving the structural designer scope to produce functional and creative packaging.

The surface is usually white and smooth and can be printed by all the main printing processes. Printing can provide important product information and attractive graphical designs.

Cartonboard can be embossed and hot foil stamped. It can be laminated to other materials, such as aluminium foil, extrusion coated with plastics, such as PE, PP and PET, and given treatments which extend its range of appearance and performance properties.

What is Solid Bleached Board?

Solid Bleached Board (SBB) is made exclusively from bleached chemical pulp. It usually has a white pigment coated top surface, comprising 2 or 3 layers and some grades are also coated on the reverse side.

SBB has excellent printing, structural design and embossing characteristics making it ideal for luxury products and for products where preservation of

COMMON ABBREVIATIONS

SBB Solid Bleached Board

SUB Solid Unbleached Board

FBB Folding Box Board

WLC White Lined Chipboard

product aroma, flavour and hygiene are critical. Examples of cartons where SBB is used are perfumes, cosmetics, chocolates, pharmaceuticals, frozen foods and cigarettes.

SBB is sometimes referred to as SBS or GZ.

What is Solid Unbleached Board?

Solid Unbleached Board (SUB) is usually made entirely from unbleached chemical pulp and is brown in colour. It is also known as SUS or UZ. For many carton applications the printing surface either has a white pigment coating or a bleached chemical pulp top layer plus coating.

The board is used where either a very high strength (puncture, tear etc.) or good wet strength properties are required. It is also referred to as Carrier Board since in addition to folding cartons it is used for multipack applications in canning and bottling.

What is Folding Box Board?

Folding Box Board (FBB) comprises middle layers of mechanical pulp sandwiched between layers of bleached chemical pulp. The top layer, or, liner, is usually white pigment coated in 2 or 3 layers. The reverse side is cream (manilla) in colour as the back layer of chemical pulp is translucent allowing the colour of the middle layers to show through. As noted in the discussion about



mechanical pulp, some producers of FBB apply a mild bleaching treatment to mechanical pulp to increase the whiteness.

FBB with either mechanical pulp middles or bleached mechanical pulp middles is described as GC2.

Where the reverse side or back layer of chemical pulp is thicker and/or white pigment coated, so that the appearance of both sides is white, the FBB is described as a White Back Folding Box Board or GC1.

FBB can be plastic extrusion coated, laminated with other materials and given other treatments to enhance its appearance and functional properties. A wide range of applications include cosmetics, chocolate and sugar confectionery, medical and healthcare, toiletries, dry foods, frozen and chilled foods, coffee and tea, biscuits and baked goods, clothing, toys, games and photographic products.

What is White Lined Chipboard?

White Lined Chipboard (WLC), also known as GD, has middle layers of recycled pulp made from mixed recovered papers or carton waste. The top layer comprises either pulp made from selected recovered paper or bleached chemical pulp. Selected recovered paper is also used for the back layer. The overall content of recycled pulp varies from about 80%

to 100%. The top surface will, typically have 2 or 3 layers of white pigment coating and it is now usual for most WLC to have a layer of white pigment coating on the reverse side and this is known as GT. WLC can be made with a white, grey or, sometimes brown reverse side (back). Plastic extrusion coatings, paper and aluminium foil laminations and other functional coatings are also available.

WLC is used in a wide range of applications which includes cereals, dry foods, frozen and chilled foods, detergent powders, confectionery outers, toiletries, household goods, electrical, engineering products, car spares, DIY, gardening, toys and games. Special treatments are available to provide fat resistance and other barrier properties for uses in fast food, pet food and soap packaging.

What other boards are used for cartons?

A small number of cartons are made with 100% recycled unlined chipboard - this is grey on both sides.

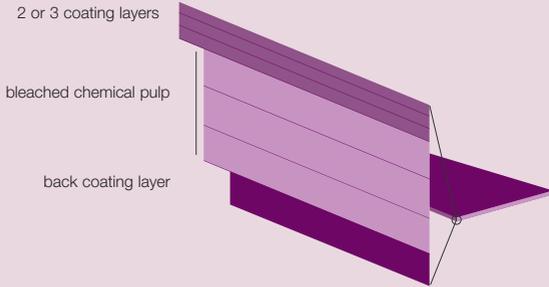
Cartons are also made from microflute corrugated board. It is used to provide additional protection for fragile products such as glass, porcelain and sensitive electronic and electrical goods, whilst at the same time providing a high standard of print and varnish appearance.

Why is cartonboard multilayered?

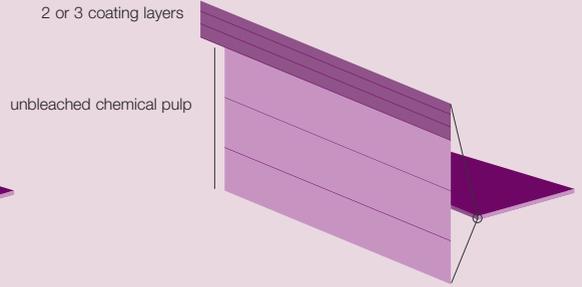
Multilayering, that is forming the cartonboard in several layers, provides important technical features and gives flexibility in the choice of fibres (pulp) for each layer. It gives the cartonboard good stiffness, creasing, folding, and gluing properties. It also assists grammage and thickness control.

It is particularly important to use good quality fibre in the two outer or surface layers. This is because the fibres in these layers, or plies, experience the greatest effect of externally applied stresses which can extend or compress them in printing, conversion (creasing/folding) and use.

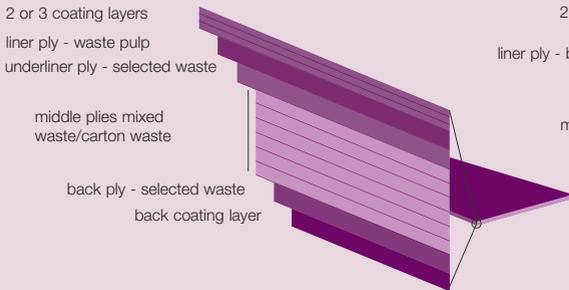
Typical solid bleached board (SBB) construction



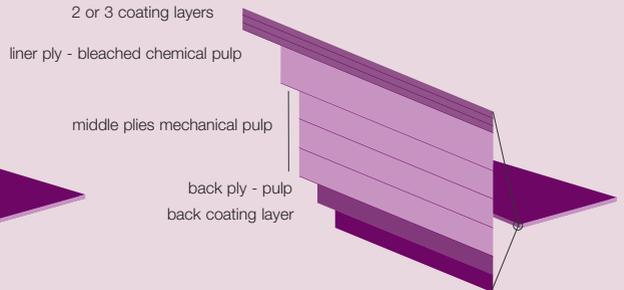
Typical solid unbleached board (SUB) construction



Typical recovered fibre cartonboard whitelined chipboard (WLC) construction



Typical folding boxboard (FBB) construction





How is cartonboard produced?

Cartonboard is produced on the board machine in several stages. Firstly, a dilute suspension of cellulose fibre (pulp) in water is formed into a thin layer of entangled fibres on a moving plastic mesh, known as the wire. Some of the water is removed by drainage and further layers of pulp are added to complete the grammage, thickness and composition of the cartonboard. The rest of the water is removed by pressing and drying, during which process inter-fibre bonding develops.

The board is usually coated to improve the whiteness, smoothness and surface finish for printing, varnishing and the general appearance. Finally, there are a number of finishing operations that take place such as slitting, reeling, sheeting, labelling, palletising and wrapping with moisture resistant material for storage and distribution.

What laminations and treatments are available?

Examples of laminations with cartonboard include aluminium foil, metallised polyester, greaseproof paper, glassine and coated preprinted paper.

Cartonboard can be off-machine cast coated using a highly polished chromium plated cylinder to give a very high gloss and/or coloured finish. Other treatments include hard sizing to increase water resistance and various treatments to impart oil and fat resistance.

Plastic extrusion coating with polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET) or polyester, give various levels of water and moisture vapour protection, heat sealability, product resistance and heat resistance for ovenable packaging. Special varnishes provide heat sealability for blister packs and wax coating - "dry" waxing for moisture and product protection and "wet" waxing for high gloss, heat sealing and product protection - is available.

What developments have there been recently in board manufacture?

Investment continues in computer controlled processing and on-machine quality monitoring leading to productivity improvements and more consistent quality. New forming and press section techniques have resulted in improved strength characteristics with the possibility of grammage reduction and less packaging overall. Fractionation - the ability to separate long and short fibres - has enabled recycled board makers to process fibres with different characteristics separately and more effectively.

The industry has eliminated the use of pulp bleached with chlorine gas (elemental chlorine). This has resulted in reducing the environmental impact of bleaching in lakes, rivers and estuaries in the vicinity of pulp mills.

Many of the Folding Boxboards now incorporate middle layers of bleached mechanical pulp to improve the brightness of the board.

There have been developments in surface coating methods, coating formulations and board machine processing, using techniques such as surface glazing and brushing, which have increased smoothness, whiteness and sheet stability. This has improved visual appearance and printing capability.

Computerised order processing and production planning, sheeting facilities close to main markets, mill storage of board in bulk whilst minimising the costs of such handling through automation, intermediate warehousing to facilitate delivery over long distances and through partnerships with merchants and carton makers all demonstrate how mills are reacting to market service needs.

CARTONBOARD MACHINE

