

Handling

When you work with multi-ply paperboard and handle it properly, you will find it is a very compliant material. The multi-ply construction is the basis of many of the excellent characteristics that help you to achieve the best quality and runnability in your printing and finishing operations. However, the multi-ply construction also requires a few special – but very important – precautions when it comes to handling.

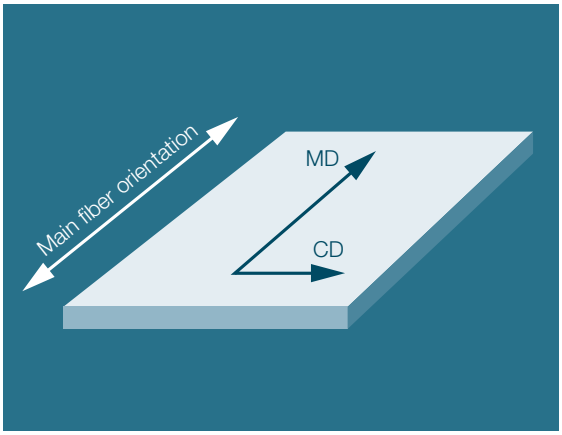
Board, moisture, and flatness

Paperboard is sensitive to changes in humidity. The main way to retain the original characteristics of the paperboard throughout all production steps is to retain its original moisture content. Exposure to variations in humidity will result in a change of paperboard shape or dimensions. Drying out will make the paperboard more brittle.

Our paperboard is produced with an original moisture content to match a relative humidity of about 50%. This is the ideal humidity content with respect to printability and runnability. Before delivery the paperboard is packed in a moisture-proof wrapper, which offers satisfactory protection against moisture changes. This protection lasts as long as the wrapper is left undamaged.

Dimensional changes of the fibres

Cellulose fibres are hygroscopic and will react to changes in humidity by swelling during moisture uptake and shrinking when losing moisture. For the cellulose fibres themselves, the relative dimensional change (swelling and shrinking) is larger by up to three times in the cross-fibre direction than in the length direction. On the paperboard machine the manufacturing process always gives some preference to fibre orientation in the machine direction (MD) of the sheet. This means that the majority of the fibres lie lengthwise, in the machine direction. When converting paperboard, the fibre direction is therefore a key parameter to consider relative to the machine direction used in the printing and finishing operations.

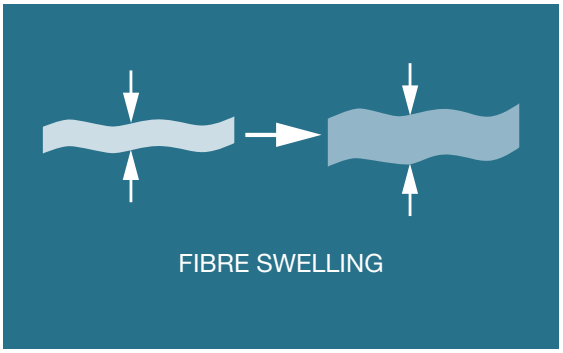


The production process on the paperboard machine always tends to lay the fibres more along the machine direction (MD). As a result, dimensional change of the sheet due to moisture is more pronounced in the cross direction (CD).

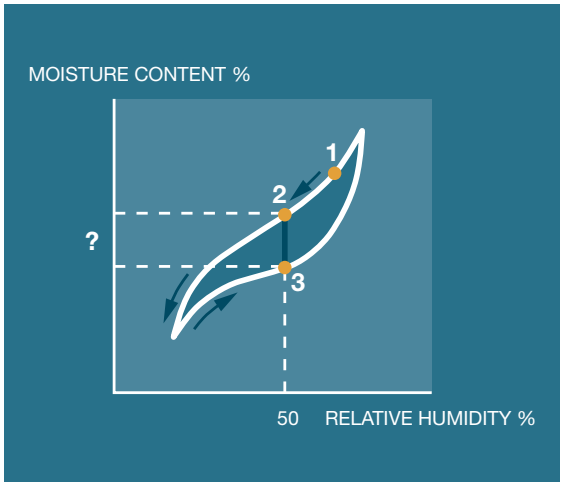
Paperboard is manufactured to be flat in a defined environment of 50% relative humidity. Exposure to another environment will create a situation where the paperboard shape becomes unstable. As paperboard is a natural material, there is practically no way to prevent it from adopting a moisture content which is in equilibrium with the surrounding air. Any change in moisture content will affect the diameter of the cellulose fibres and therefore the shape of the paperboard sheet. If the front and back of the paperboard sheet experience an equal amount of dimensional change due to moisture, any change in moisture will only affect the sheet's dimensions, i.e. expansion or shrinkage. However, when the dimensional changes are unequal (asymmetric), any given change in moisture will cause the sheet to curl.

Different types of curl and twist

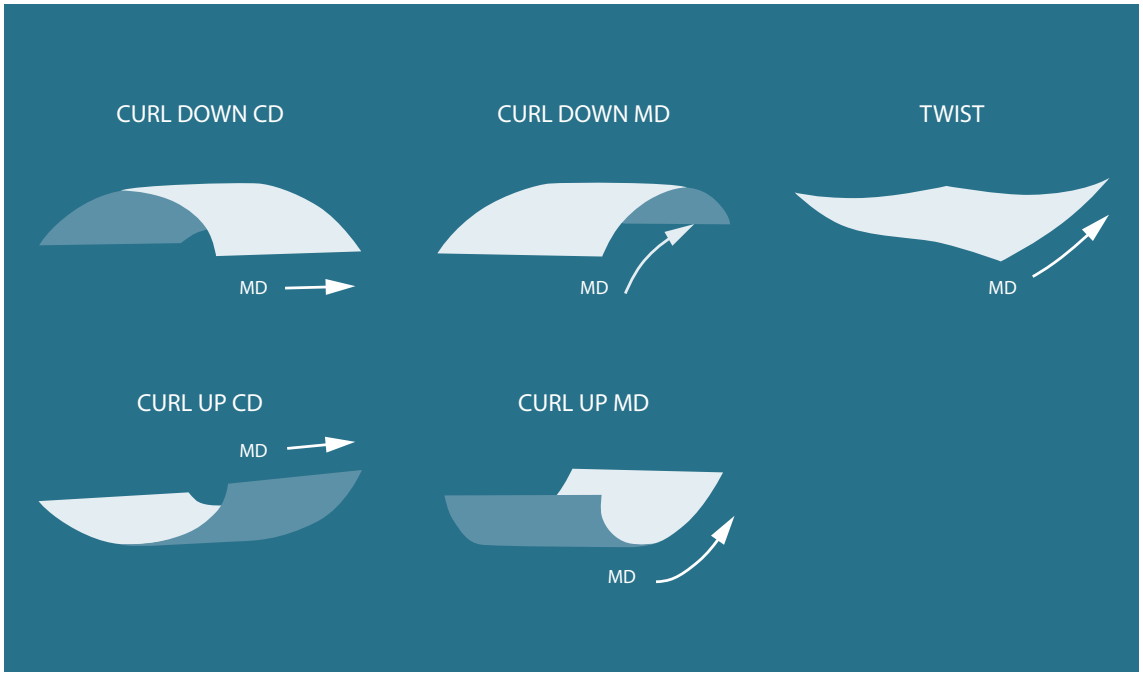
Deviations from flatness are defined in terms of curl and twist. Flatness should be evaluated on a single sheet and not on a pallet, since the shape of a pallet can be influenced by thickness variations. If the curl is oriented in the machine direction of the paperboard, it has nothing to do with moisture effects. This curl, called reel curl, occurs when the paperboard has been stored for a long period of time in reels tightly wound around a narrow diameter core and may have been insufficiently decurled during the sheeting operation.



Wood fibre swells more across its width than along its length.



Due to the hysteresis effect, changes in relative humidity in the converting environment will affect the moisture of the paperboard in different ways depending on whether the moisture increases or decreases.



Best practice after delivery

Arrange for proper storage

It is very important to arrange for the proper storage of the paperboard as soon as it arrives. Since paperboard is hygroscopic, it should neither be exposed to too humid conditions nor too dry conditions in order to maintain its original moisture content. Also, the paperboard should not be exposed to too low or too high temperatures. Direct sunlight should be avoided.

We advise you to take the following precautions

- Leave the wrapping in place until just before you print. This is important because the plastic preserves the original moisture content of the paperboard and also protects it from being damaged.
- Do not leave the paperboard pallets outdoors, not even under a roof. Fluctuations in temperature and humidity may alter the properties of the paperboard due to swelling or shrinking of the fibres.
- Make sure that the paperboard is kept in a room that has even temperature and humidity so that it becomes acclimatised to the environment where it will be printed.

Best practice in production and use

Traceability

The delivered paperboard is identified by its order number and its pallet or reel number. We recommend that you record these numbers to provide identity and traceability throughout printing, finishing and use, or that you keep the labels until the job is finished. Knowing the order and pallet numbers speeds up problem solving in the event of quality variations.



Before printing and finishing

Correct handling of paperboard is very important for achieving the best results in printing, finishing and use. To ensure this we recommend the following procedures:

- Avoid printing on paperboard that has not been at “rest” in its plastic wrapping for two to three days after delivery.
- Do not remove the moisture-proof wrappers until the board has attained the same temperature as the environment in the printing or finishing room. Please note the table below.
- The recommended relative humidity in the printing and finishing rooms to prevent curl, misregister, or other problems is 45 – 60%. Please refer to the above section “Board, moisture and flatness”.
- Avoid manual cutting of the sheets. If the cuts are not 100% correct they might induce stresses in the sheets that might cause the different layers to separate from each other.

The table below shows warming-up times before removal of the wrappers, i.e. the time required for the paperboard to attain the same temperature as the environment, depending on the initial temperature differences.

Pallet or reel weight	Initial temperature difference between board and printing room (room temp assumed to be about 20 °C)		
	10 °C	20 °C	30 °C
400 kg	2 days	2 days	3 days
800 kg	2 days	3 days	4 days
1,200 kg	2 days	4 days	5 days

It is very important to pay attention to the warming-up time. The time required to establish the temperature equilibrium varies depending on the temperature difference and the weight of the board pallet or reel. The wrappers should not be removed before the board has reached the temperature in the printing room. If unwrapped cold paperboard is exposed to a warm environment, the air adjacent to the board might be cooled below its dew point (i.e. point of condensation). This moisture will then be absorbed by the paperboard.



During printing and finishing

Multi-ply paperboard needs to be handled with care or it can easily be damaged. One particular form of damage is cigar rolls (or roll backs) caused by the rolling up of the top layer of a sheet. You can prevent this problem completely by ordering unreamed paperboard and the right sheet size from the manufacturer. If the board is stacked directly on the pallet at the board mill (without any subsequent handling) and the printer direct feeds, then these “cigars” are normally never seen. Should you need to restack the paperboard, avoid moving reams that are too heavy or use two operators.

After printing and finishing





The moisture content can decline after printing, especially when the sheet has been IR or UV dried. If the temperature of the pile attains more than 60 °C – and if the paperboard is not properly protected – it could lose its moisture when cooling.

This is why paperboard in sheet form should be rewrapped with moisture-resistant material after printing. Rewrapping is particularly important in order to ensure perfect register when the paperboard is printed in two or more passes through the printing press. It is also important to wrap in this way in order to achieve good register between the print and the next process, e.g. cutting and creasing, guillotining or bookbinding.

The finished paperboard product should be wrapped in moisture-resistant material after finishing and prior to shipment to the customer or to further finishing operations.