Mullen Test vs. Edge Crush Test Boxes

A COMPREHENSIVE COMPARISON

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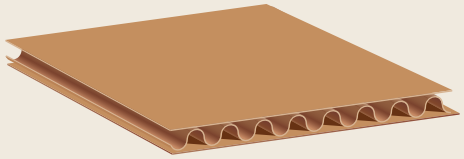
Introduction

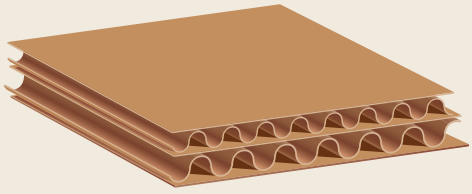
Choosing the correct corrugated box for an intended application on the surface appears simple. Measure and weigh the item needed to ship, select an appropriate-sized box, load the contents, protect it with bubble, foam, or other fill material, and send the package with the correct labels. But things become more apparent when you look at the number of corrugated types. There are varying thicknesses (single wall, double wall, triple wall), several different flute types (A, B, C, E, F), and various papers that manufacturers can use to construct corrugated boards. All of these factors determine the strength and durability of a box. If it is too weak, the box may collapse or puncture. But if it's too strong, you're using unneeded excess material and incurring unnecessary additional costs.

Board Styles & Flute Types

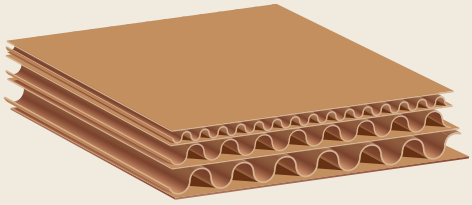
Single Face Board



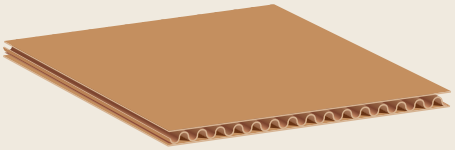
Single Wall Board



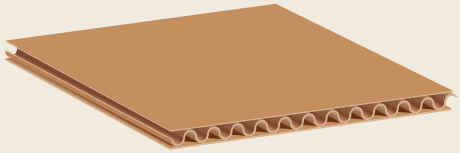
Double Wall Board



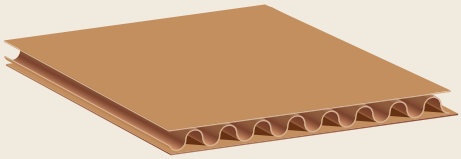
Triple Wall Board



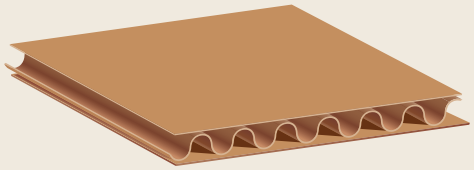
F Flute



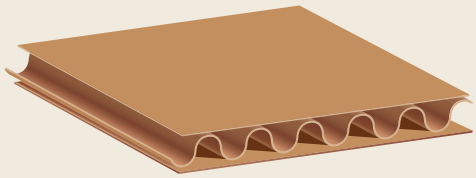
E Flute



C Flute



B Flute

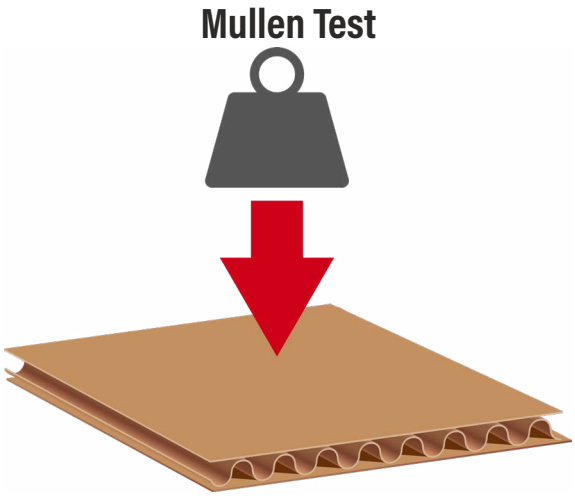


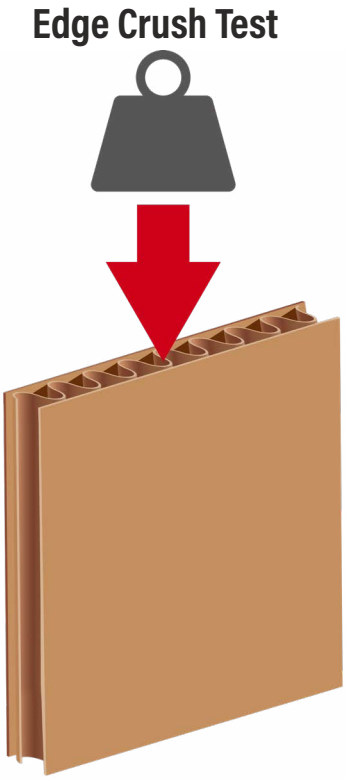
A Flute

Defining Mullen Test vs. Edge Crush Test (ECT)

There are currently two tests used throughout the corrugated industry to determine strength. Historically, the long-time industry standard has been the Mullen Test, related to the rough handling durability of corrugated material. The Mullen Test measures the force required to rupture or puncture the face of the corrugated board. This force is indirectly related to a box's ability to withstand external or internal forces, thus containing and protecting its contents during shipment. Mullen Test reports burst strength in pounds, i.e., 200#.

A newer standard that has achieved widespread acceptance is the Edge Crush Test. The Edge Crush Test, or ECT, is a true performance test directly related to a box's stacking strength. ECT is a measure of the edgewise compressive strength of a corrugated board. ECT measures strength by compressing a small segment of the board on the edge between two rigid plates perpendicular to the direction of the flutes until the test establishes a peak load. The results are measured in pounds per lineal inch of the load-bearing edge, denoted as lb/in, but usually reported as an ECT value, for example, 32 ECT.





Strength Equivalencies of Mullen Test vs. ECT Boxes

The charts below show the industry standard conversion between Mullen and ECT corrugated boxes with their maximum suggested load per box.

SINGLE WALL CORRUGATED BOXES

MAX LOAD CAPACITY	MAX OUTSIDE DIMENSIONS	MULLEN TEST (BURST)	EDGE CRUSH TEST (ECT)
20 lb	40 in	125#	ECT-23
35 lb	50 in	150#	ECT-26
50 lb	60 in	175#	ECT-29
65 lb	75 in	200#	ECT-32
80 lb	85 in	250#	ECT-40
95 lb	95 in	275#	ECT-44
120 lb	105 in	350#	ECT-55

DOUBLE WALL CORRUGATED BOXES

MAX LOAD CAPACITY	MAX OUTSIDE DIMENSIONS	MULLEN TEST (BURST)	EDGE CRUSH TEST (ECT)
100 lb	95 in	275#	ECT-48
120 lb	105 in	350#	ECT-51
140 lb	110 in	400#	ECT-61
160 lb	115 in	500#	ECT-71
180 lb	120 in	600#	ECT-82

TRIPLE WALL CORRUGATED BOXES

MAX LOAD CAPACITY	MAX OUTSIDE DIMENSIONS	MULLEN TEST (BURST)	EDGE CRUSH TEST (ECT)
240 lb	110 in	700#	ECT-67
260 lb	115 in	900#	ECT-80
280 lb	120 in	1100#	ECT-90
300 lb	125 in	1300#	ECT-112

Max Outside Dimensions = Length, Width, and Depth Added Together

Differences Between Mullen Test and ECT Boxes

The fundamental difference between the two box types is that the Mullen Test requires a minimum board basis weight. In other words, the Mullen Test requires that the base papers used to make corrugated fiberboard weigh at least a certain minimum of pounds per unit area. ECT eliminated this requirement, allowing manufacturers to use lighter-weight materials while still providing high performance. When comparing two identically sized boxes with equivalent strengths, one being Mullen Test rated and one being ECT rated, the ECT-rated box will weigh less because it uses less corrugated material.

Sustainability Impact

ECT Boxes Offer Equivalent Strength and a More Sustainable Choice

Due to using less material, ECT boxes have two distinct advantages over Mullen Test boxes. They provide more sustainable benefits and reduce shipping costs through their lighter weight.

In other words, the ECT-rated corrugated provides an equivalent level of strength but uses less material. Using less material translates into fewer raw materials, lower energy requirements, and reduced pollution in all package life cycle and supply chain stages. Additionally, combining lighter materials in a box with increasing amounts of recycled content means ECT-rated corrugated reduces waste even further.

More Information

For guidance on choosing the correct corrugated box for your application, contact us today!

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