STRUCTURAL PACKAGING

DESIGN YOUR OWN BOXES AND 3-D FORMS

Paul Jackson

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Laurence King Publishing

LAURENCE KING

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email: enquiries@laurenceking.com
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Box production: Gilad Dies Ltd, Holon, Israel
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Contents

Over the past two decades or so, a steady flow of packaging source books has published many hundreds of ready-to-use templates (called 'nets') for a broad range of cartons, boxes and trays. These excellent books can be extremely useful to a reader seeking an off-the-peg solution to a design problem, but they don't describe how bespoke packaging can be created, implying that innovation is something best left to the specialist packaging engineer.

I disagree!

In the 1980s I developed a simple system – a formula, even – for creating the strongest possible one-piece net that will enclose any volumetric form which has flat faces and straight sides. In its most practical application, it is a system for creating structural packaging.

This system of package design has been taught on dozens of occasions in colleges of design throughout the UK and overseas. I have routinely seen inexperienced students create a thrilling array of designs that are innovative, beautiful and practical, some of which have gone on to win prizes in international packaging competitions. It has also been taught on many occasions to groups of design professionals, who have used it to develop new packaging forms.

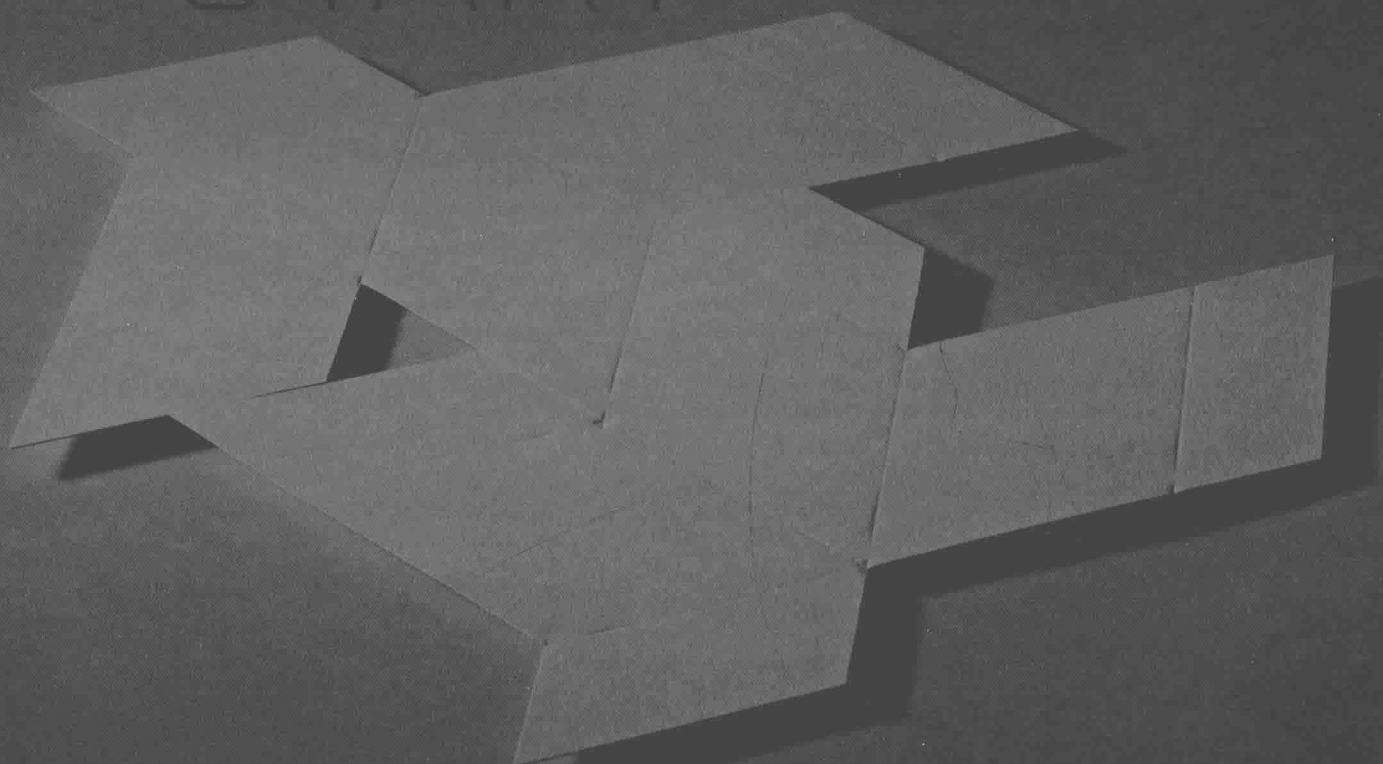
This book presents that system.

However, it is more than just a system for creating innovative packaging. I have used it frequently in my own design work in projects as diverse as point-of-purchase podia, exhibition display systems, mail-shot teasers, teaching aids for school mathematics classes, large 3-D geometric sculptures, 3-D greetings cards ... and much more. It is primarily a system for creating structural packaging, but as you will see, when properly understood, it can be applied to many other areas of 3-D design.

In that sense, this is a book not only for people with an interest in structural packaging, but also for anyone with an interest in structure and form, including product designers, architects, engineers and geometricians.

01:

BEFORE YOU START



1.1 How to Use the Book

The book presents a step-by-step system to design packaging and other enclosed volumetric forms. You are strongly encouraged to read it sequentially from the first page to the last, as though it were a novel. To flick casually backwards and forwards, stopping randomly here and there to read a little text and look at a few images will probably not be enough for you to learn the method with sufficient rigour to gain any significant and lasting return from the book. Used diligently, the book will enable you to create strong, practical forms of your own design. Used superficially, it will perhaps teach you little.

Chapter 2, How to Design the Perfect Net (pages 14 to 37), is the core of the book. The chapters that follow show how the methods of net design presented in it can be applied. The final chapter presents a series of packaging forms created by students of design at the Hochschule für Gestaltung, Schwäbisch Gmünd, Germany, developed from the forms seen in previous chapters.
By working through the book sequentially, you should reach the final pages understanding enough about the theory and application of the net design method to create your own high-quality, original work.

My strong recommendation is to resist temporarily the urge to create. Instead, open yourself to learning and then to applying creatively what you have learnt.

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1.2 How to Cut and Fold

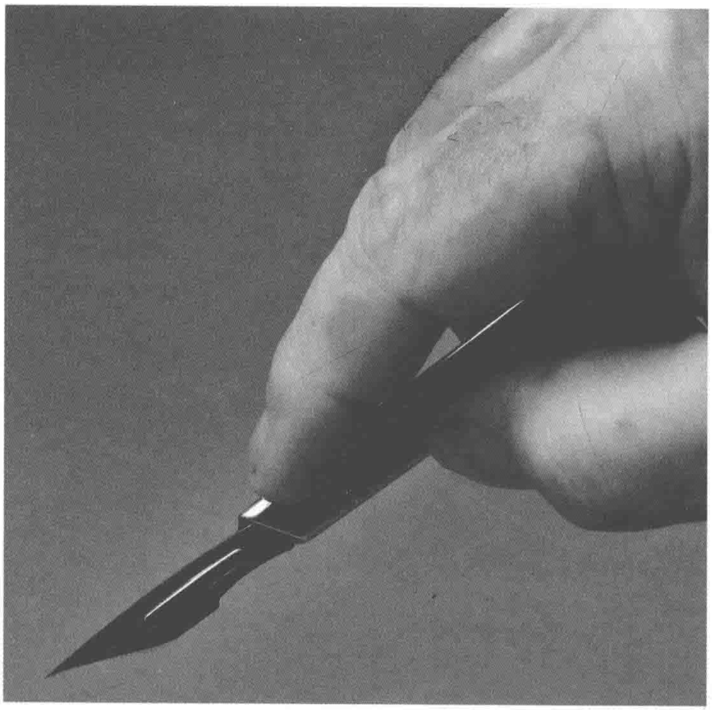
1.2.1 Cutting

If you are cutting card by hand, it is important to use a quality craft knife or, better still, a scalpel. Avoid using inexpensive 'snap-off' craft knives, as they can be unstable and dangerous. The stronger, chunkier ones are more stable and much safer. However, for the same price you can buy a scalpel with a slim metal handle and a packet of replaceable blades. Scalpels are generally more manoeuvrable through the card than craft knives and are more help in creating an accurately cut line. Whichever knife you use, it is imperative to change the blade regularly.

A metal ruler or straight edge will ensure a strong, straight cut, though transparent plastic rulers are acceptable and have the added advantage that you can see the drawing beneath the ruler. Use a nifty 15cm ruler to cut short lines. Generally, when cutting, place the ruler on the drawing, so that if your blade slips away it will cut harmlessly into the waste card around the outside of the drawing.

It is advisable to invest in a self-healing cutting mat. If you cut on a sheet of thick card or wood, the surface will quickly become scored and rutted, and it will become impossible to make straight, neat cuts. Buy the biggest mat you can afford. Looked after well, it will last a decade or more.

A scalpel held in the standard position for cutting. For safety reasons, be sure to always keep your non-cutting hand topside of your cutting hand.



1.2.2. Folding

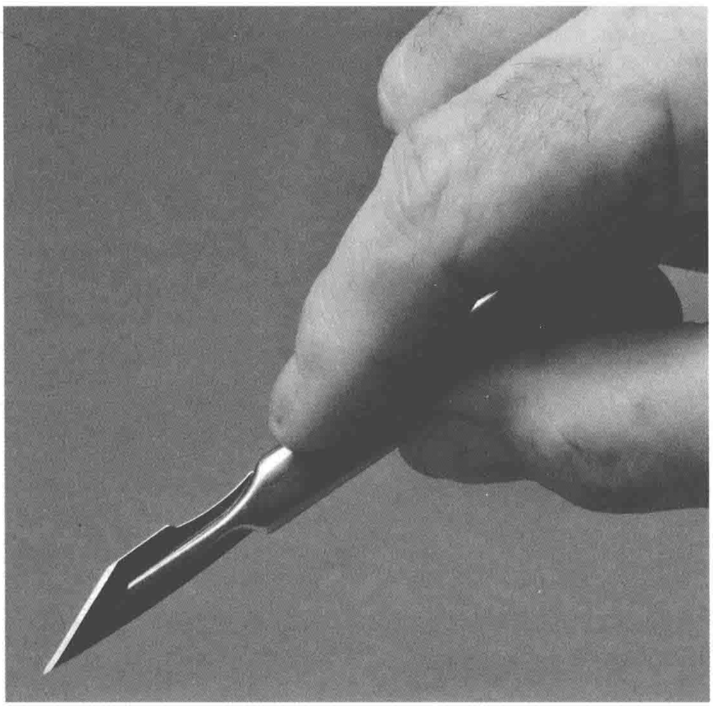
While cutting paper is relatively straightforward, folding is less so. Whatever method you use, the crucial element is never to cut through the card along the fold line, but to *compress* the fold line by using pressure. This is done using a tool. Whether the tool is purpose-made or improvized is a matter of personal choice and habit.

Bookbinders use a range of specialist creasing tools called bone folders. They compress the card very well, though the fold line is usually 1–2mm or so away from the edge of the ruler, so if your tolerances are small, a bone folder may be considered inaccurate.

A good improvized tool is a dry ball-point pen. The ball makes an excellent crease line, though like the bone folder, it may be a little distance away from the edge of the ruler. I have also seen people use a scissor point, a food knife, a tool usually used for smoothing down wet clay, a fingernail (!) and a nail file.

But my own preference is a dull scalpel blade (or a dull craft-knife blade). The trick is to turn the blade upside down (see below). It compresses the card along a reliably consistent line, immediately adjacent to the edge of the ruler.

A scalpel or craft knife makes an excellent tool with which to create a fold. Held upside down against the edge of a ruler, it does not cut the card along the length of the fold line, but compresses it.



1.3 Using Software

When I teach, I must by necessity ask my group to construct their nets manually – it simply isn't practical to design with a computer. So we make nets using a hard pencil, rulers, a protractor, a pair of compasses, set squares and – of course – erasers. In truth, this is absolutely the best way to learn how to design a net. Later, when a perfect net has been designed, it can be drawn using a computer.

However, the correct ways to draw accurate squares, parallel lines, polygons and so on by hand, and how to calculate angles, are rarely taught now in schools or in design colleges, so when I teach, a lot of time is given to explaining the basic principles of technical drawing. To explain basic TD within these pages is beyond the scope of this book, so the reader wishing to construct by this manual method is encouraged to seek information elsewhere.

More likely though, the reader will use the system of net design presented in this book to create a rough net, which will then be drawn accurately on a computer.

There is a wide choice of excellent CAD software suitable for drawing nets, some of which is available in less powerful Freeware versions. It is also possible to use graphic design software, though geometric constructions can sometimes be a little laborious to make. Essentially, any software that can create two-dimensional geometric constructions is suitable. If you already have a reasonable knowledge of a particular CAD or graphics application, you can probably use it to create accurate nets. If you have no such knowledge, one of the Freeware CAD applications is a good place to start. If that is beyond you, simply purchase a basic set of inexpensive geometry equipment (the list is in the first paragraph, above) and make everything by hand.

1.4 Choosing Card

All the examples photographed for the book were made with 250gsm card. If you are making examples from the book, or creating your own maquettes, this is the recommended weight to use. If you know you will eventually use thicker boards, or even corrugated cardboard, for your final design, it is still recommended that you make maquettes in 250gsm card before moving up to the heavier weights. Try to use a matt card, rather than a coated glossy card, as a matt surface will fold better, has more grip to lock a net tightly together, can be drawn on more easily, and is generally more workable and user-friendly than coated card. If you need to impress someone with what you have made, a bright white card creates better-looking boxes than a dull white or off-white card.

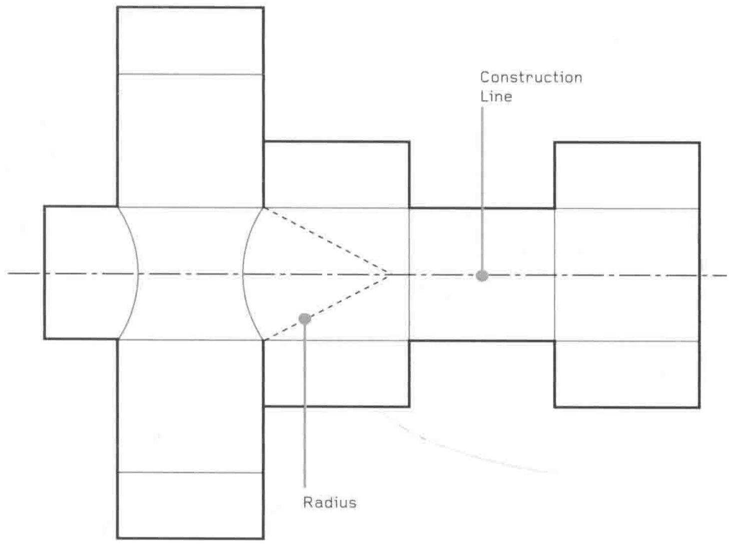
If you are designing a one-off package for a personal project, or for a low handmade production run, you may choose any type of card. However, if you are intending to manufacture your design in quantity, you will need to consult a specialist packaging engineer to discuss which card is best for your needs. More about this can be found in How Do I Produce My Box? (see page 126).

One more thing: although the book features packaging made in card, many of the nets can be adapted to plastic or, more specifically, polypropylene. The possibilities of creating in polypropylene are immense and visually exciting, especially if the material chosen is translucent or transparent.

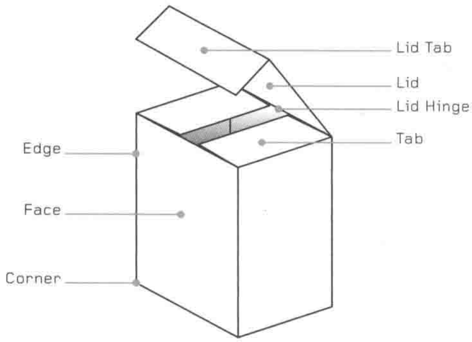
1.5 Glossary

Like most specialist activities, structural packaging has a terminology all its own, though many of the terms are logical or self-explanatory. When working through the book, refer back to this section if you come across an unfamiliar term.

1.5.3 Construction Lines

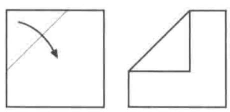


1.5.1 Box

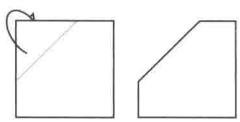


1.5.2 Valley and Mountain Folds

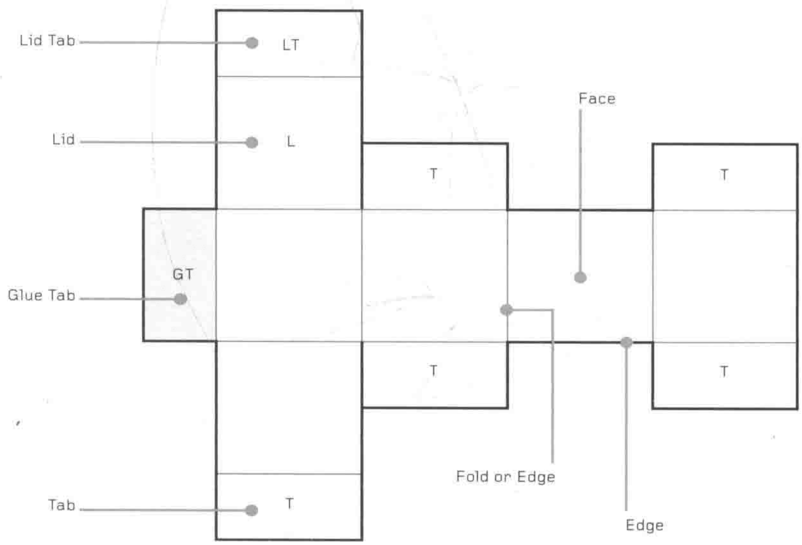
Valley Fold



Mountain Fold

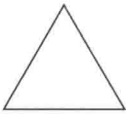


1.5.4 Net



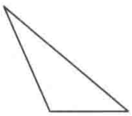
1.5.5 Polygons

A polygon is a flat shape bounded by a closed path of straight sides. Any packaging form consists of a number of polygons, arranged in three dimensions. Some polygons – especially those with three or four sides – are subtly different one from another, and have different names. Knowing the names and understanding the differences will not only help you to understand the book better, but will also help you to design better.



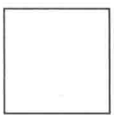
Equilateral Triangle
(all angles and all sides are equal)

Isosceles Triangle
(two angles and two sides are equal)



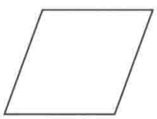
Scalene Triangle
(all angles and all sides are different)

Right-angled Triangle
(one angle is a right angle)

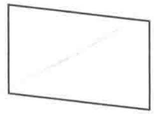


Square
(a four-sided polygon in which all angles and all sides are equal)

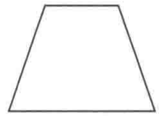
Rectangle
(a four-sided polygon in which all angles and opposite sides are equal)



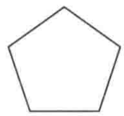
Rhombus
(a four-sided polygon in which opposite angles and all sides are equal)



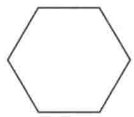
Parallelogram
(a four-sided polygon in which opposite angles and opposite sides are equal)



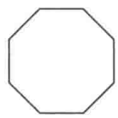
Trapezium
(a four-sided polygon with one pair of parallel sides and opposite angles totalling 180°)



Regular Pentagon
(a five-sided polygon in which all angles and all sides are equal)



Regular Hexagon
(a six-sided polygon in which all angles and all sides are equal)



Regular Octagon
(an eight-sided polygon in which all sides and all angles are equal)

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