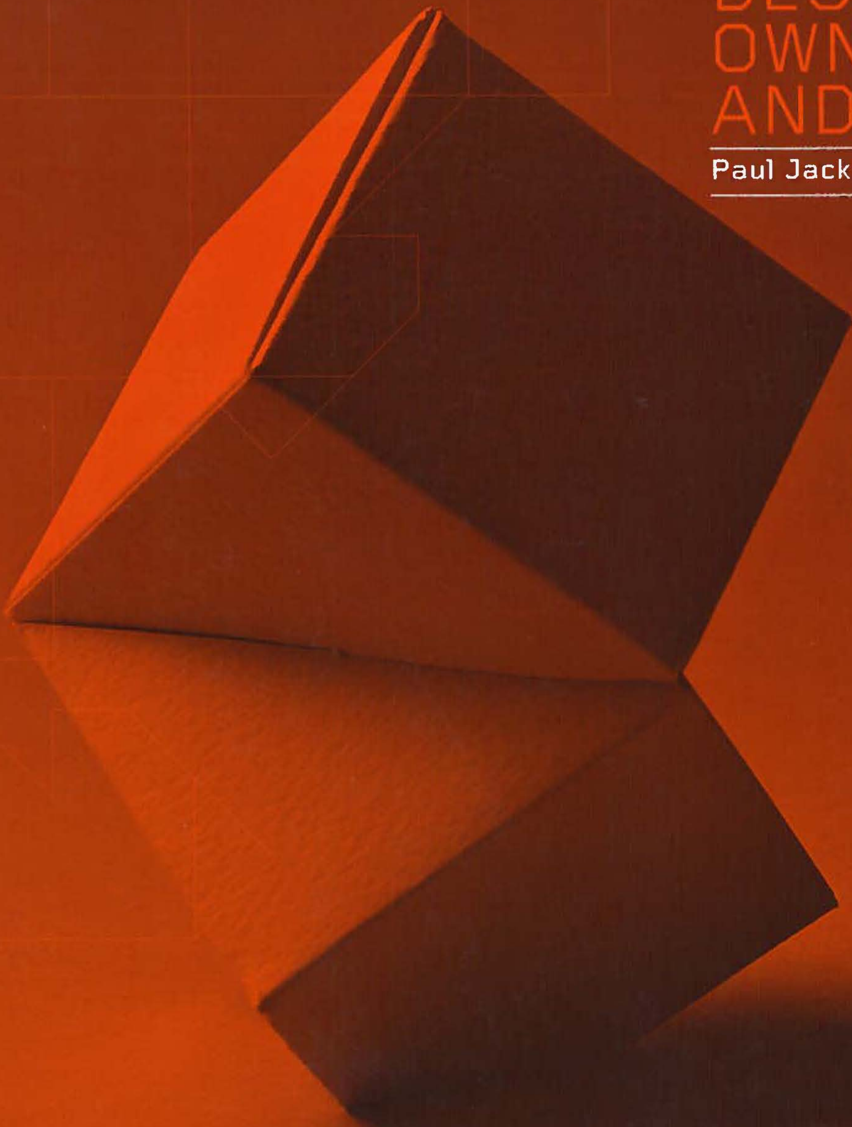
STRUCTURAL PACKAGING

DESIGN YOUR OWN BOXES AND 3-D FORMS

Paul Jackson



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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.

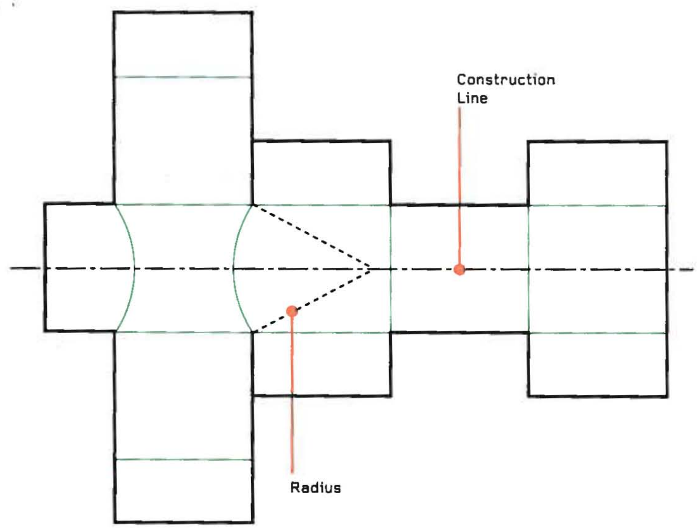
However, it is more than just a system for creating innovative packaging. I have used it frequently in my own design work in projects as diverse as point-of-purchase podia, exhibition display systems, mail-shot teasers, teaching aids for school mathematics classes, large 3-D geometric sculptures, 3-D 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.

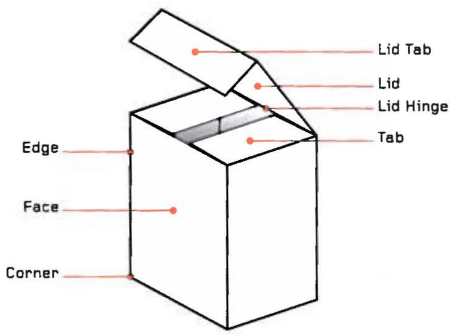
1.5 Glossary

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

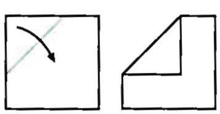


1.5.1 Box

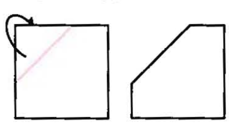


1.5.2 Valley and Mountain Folds

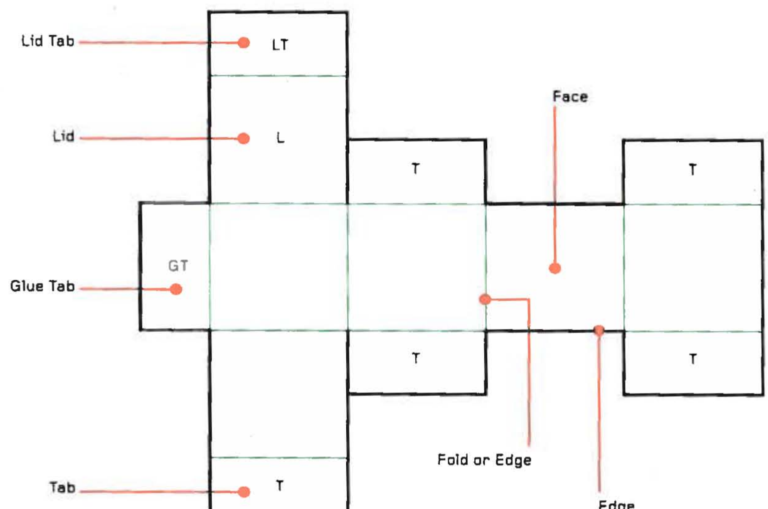
Valley Fold



Mountain Fold

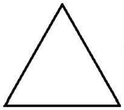


1.5.4 Net

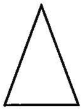


1.5.5 Polygons

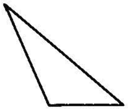
A polygon is a flat shape bounded by a closed path of straight sides. Any packaging form consists of a number of polygons, arranged in three dimensions. Some polygons – especially those with three or four sides – are subtly different one from another, and have different names. Knowing the names and understanding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



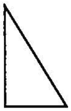
Equilateral Triangle
(all angles and all sides are equal)



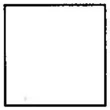
Isosceles Triangle
(two angles and two sides are equal)



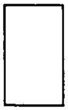
Scalene Triangle
(all angles and all sides are different)



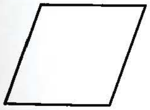
Right-angled Triangle
(one angle is a right angle)



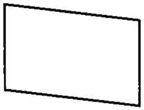
Square
(a four-sided polygon in which all angles and all sides are equal)



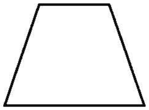
Rectangle
(a four-sided polygon in which all angles and opposite sides are equal)



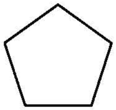
Rhombus
(a four-sided polygon in which opposite angles and all sides are equal)



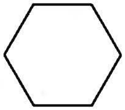
Parallelogram
(a four-sided polygon in which opposite angles and opposite sides are equal)



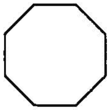
Trapezium
(a four-sided polygon with one pair of parallel sides and opposite angles totalling 180°)



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)

Introduction

This chapter is the core of the book. It describes in detail how to design a strong, one-piece, self-locking net to enclose any polyhedron (a three-dimensional figure with straight edges and flat faces).

The system it describes is precise and exacting and must be followed accurately, almost to the point of obsession – at least at first. Later, when you are familiar with it, you may take a short cut here, miss a step there, but at first it is necessary to learn it thoroughly.

Time spent on this chapter will be well rewarded. The longer you spend with it, the more you will understand when you come to design your own packaging – and the more innovative and practical this will be. Skip lightly over this chapter and your ability to design will be compromised. Sometimes, creativity comes from thinking freely without limitations, and sometimes it comes from learning something thoroughly and then applying it. Structural packaging is definitely in the latter category.

So please work slowly through this chapter; read it carefully and, if you have the time, make the examples. The chapters that follow use what it teaches, so understanding the principles of net design described in the following pages will enable you to understand how complex nets are constructed, and how you can use or adapt them.

Step 1:

By making drawings and rough 3-D models, decide the form of the package you want to make. This is the creative step!

This first step is the most important. If your design is poorly conceptualized, the most perfectly made net will not save it from criticism. It is crucial to spend as much time as possible drawing, making quick 3-D models and discussing ideas and results with colleagues, so that you are confident that what you have designed in rough is ready to be taken through the sequence of technical net construction steps that follow.

If you are looking for ideas, use the book for inspiration. The latter half in particular contains many interesting packaging forms which are probably not exactly right for your needs, but which can be adapted or combined to create something original, using the principles of net construction explained in this chapter.

You should not begin Step 2 until you are confident that your roughly made package (or box, tray, bowl, display stand, sculpture or whatever) is absolutely the right design.

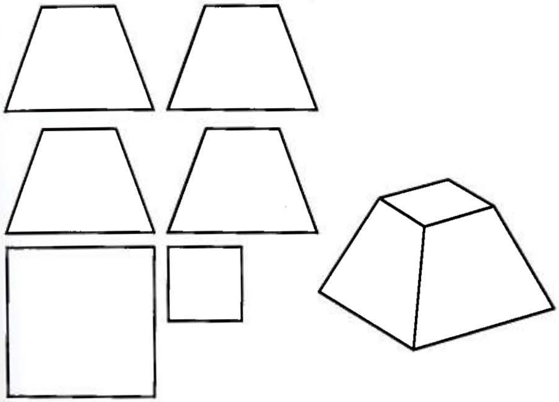
Remember: this book does not tell you **what** to design, but **how to make** what you have designed.

Step 2:

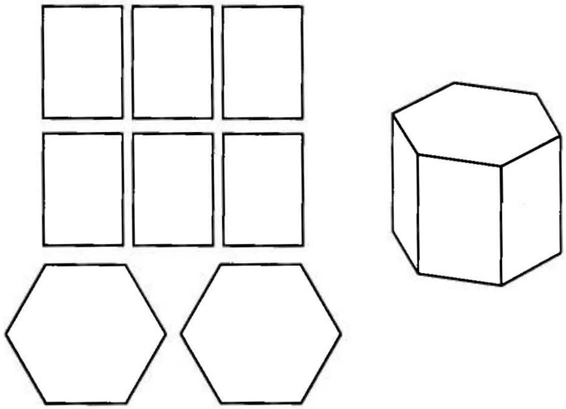
Using one sheet of card for each face, construct the package as a solid brick. Hold the faces together with masking tape. Give no thought to the net, the lid or the tabs.

Make each face carefully from a sheet of card. This can be done either by hand using geometric construction equipment, or by using a CAD or graphics application and making printouts of the faces. If you are unsure of the dimensions of your packaging, this step will fix them, though they can always be changed later.

Use masking tape to fix all the faces together strongly, edge to edge. (Masking tape is a low-tack beige-coloured paper tape, widely available from office suppliers, home improvement stores and art/craft retailers.) Avoid using a plastic tape, as you will need to write on the tape in Step 3. The result should be a well-made, sturdy dummy of your package held together with tape.



Example 1
Four trapeziums and two squares create a truncated pyramid. The length across the top of each trapezium is the same as the side length of the small square. The length across the bottom of each trapezium is the same as the side length of the big square. The height and slope of the trapeziums are unimportant, but if you are copying this design as a learning exercise, make the trapeziums look somewhat like those shown here.



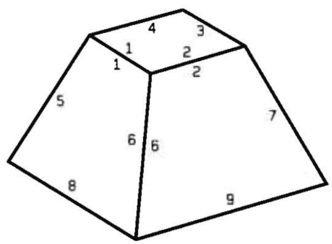
Example 2
Six rectangles and two hexagons create a hexagonal prism. The height of the rectangles is unimportant, but their shorter sides are the same length as the sides of the hexagons.

Step 3:

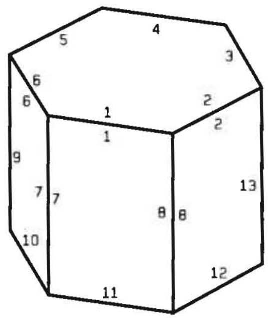
Write pairs of identical numbers across each edge.

These pairs of numbers locate the position of each face in relation to all the other faces, so that if the pieces were separated, the package could be assembled again like a 3-D jigsaw. More importantly, the numbers also show which edge on which face touches which other edge on which other face. Knowing which edges touch means the tabs can later be added in the correct places.

For clarity, write the numbers large and in the approximate centre of an edge. There is no logic to the numbering system; the edges can be numbered in any sequence, no matter how random.



Example 1



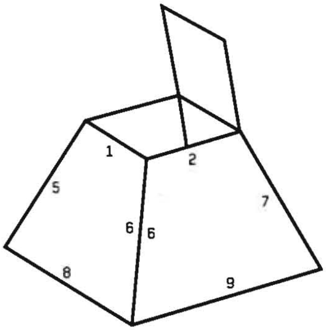
Example 2

Step 4:

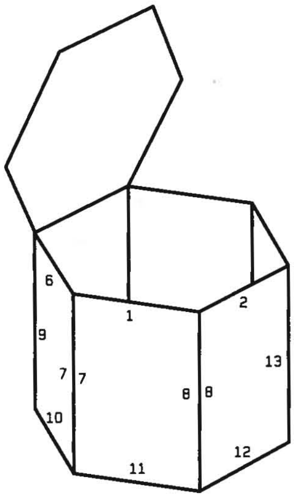
If the package has a lid, cut it loose.

Depending on what you are making, your 'package' may not be a package at all, but a 3-D form with another function. If so, you may not need a lid and can skip this step. But if your 3-D form is indeed a package, it probably will have a lid. The shape and position of the lid would have been decided in Step 1.

With a sharp knife, cut carefully through the masking tape to release the lid, leaving it joined to the remainder of the package along one edge. Cut through the tape rather than removing it, as removing it may pull off the numbers you added in Step 3.



Example 1
The most sensible face on the package for a lid is the small square, though the big square would give easier access to the interior.



Example 2
A hexagon is an obvious face for a lid, though it would be more interesting to create a lid from one of the rectangles.

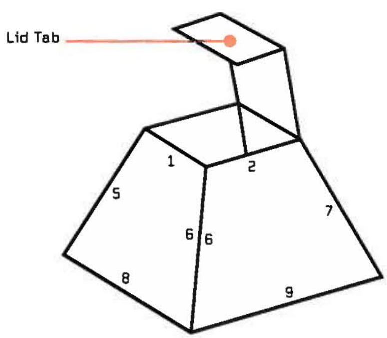
Step 5:

Using masking tape, affix a tab securely to the lid edge that is opposite the hinge. If no edge is opposite, choose another edge instead. The tab should have corners of 90°.

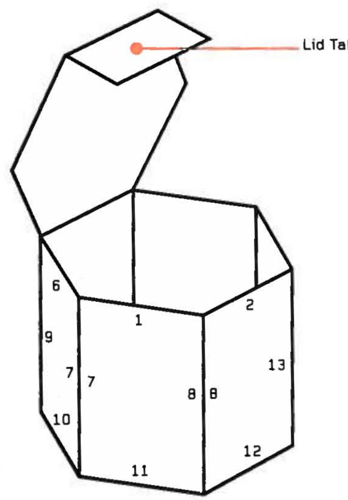
This first tab is called the 'lid tab' and is the most important tab on the net because it determines the positions of all the other tabs.

The temptation is to make it too skinny, but instead, be generous and make it quite deep. It is easier to trim it narrower later than to remake it deeper. Fix it securely to the lid with masking tape, front and back.

The tab may need corners with angles of less than 90° if it is to be fitted into a tapering face. The 'Troubleshooting' section on page 32 will help you. On no account make the corners of the tab bigger than 90°; if you do, it will not slide in and out of the package easily.



Example 1
The lid tab is placed in a conventional position on the lid.



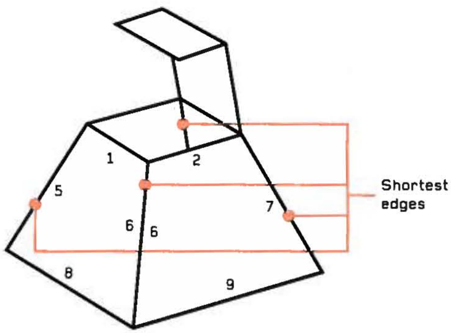
Example 2
The lid tab is placed on a hexagonal lid so, unusually, there are two empty edges to the lid left and right of the tab on the way back to the lid hinge.

Step 6:

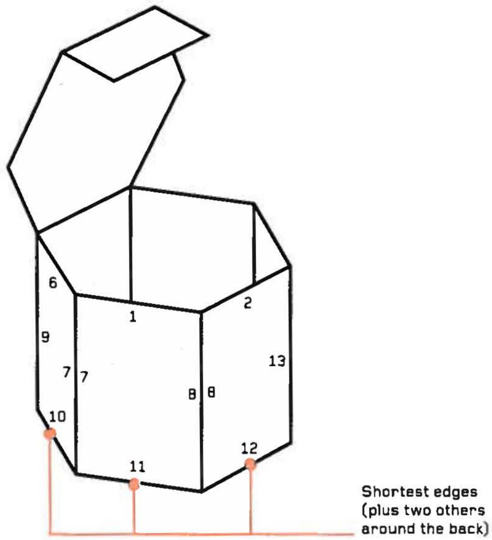
Cut loose as many of the shortest edges as you can.

Pick up your package and examine it carefully. Make a mental note of which edges are the shortest. There may be just one or two of them, or perhaps quite a few of equal length.

Then cut through as many of those shortest edges as you can without releasing a face completely from the others so that it falls off. It's not important which edges you cut or leave uncut, but it helps to try to work symmetrically, doing the same cutting top and bottom, or left and right, around the form.



Example 1
The shortest edges are all the sloping edges of the trapeziums.



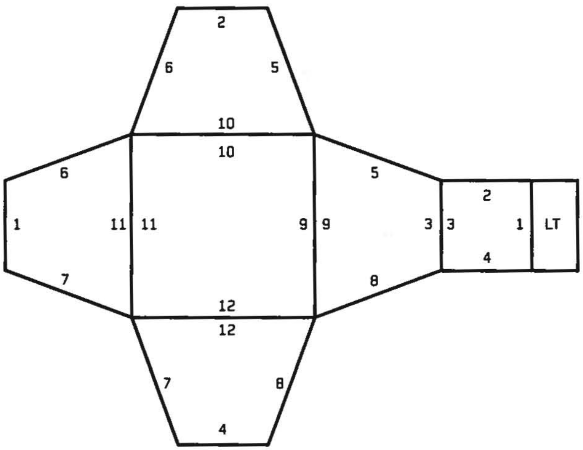
Example 2
Cut through five of the six short edges around the bottom of the package. The sixth edge is left uncut. Try to leave this uncut edge directly under the lid hinge, so that in Step 7 the hexagons are in line, one beneath the other.

Step 7:

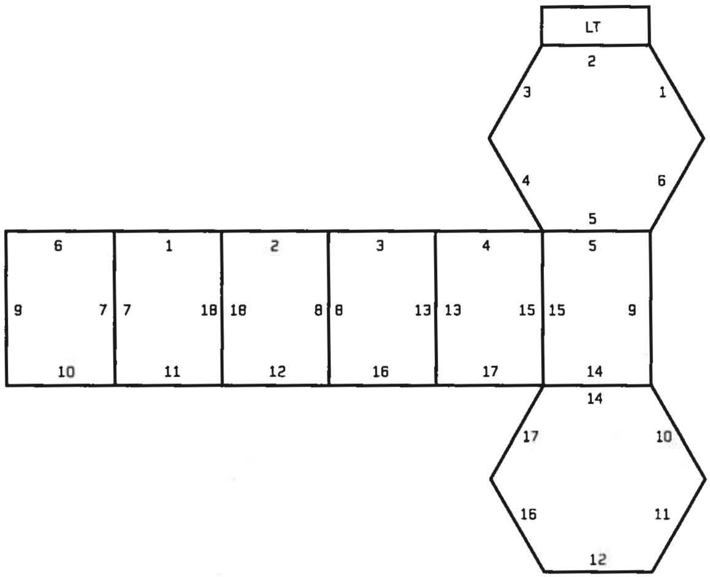
Now, cut open the remainder of the package until it can be laid out flat. Begin by cutting loose the shortest edges that remain uncut, then cut loose progressively longer and longer edges.

This is a critical step because, for the first time, your design has transformed from a 3-D form into a 2-D net. It may be that you make a mistake or two in the cutting, by cutting long edges when you should have cut shorter ones. If so, reassemble the package to create a 3-D form, and apply masking tape to join together edges that were mistakenly separated. Then cut other edges loose. If during this process you become confused as to which edge touches which other edge, the number pairings will keep the faces and edges correctly aligned.

If your package has a large number of faces, there will be a very large number of ways in which it can be cut open to become flat. These options will be limited by cutting the shortest edges first (Step 6), then by cutting progressively longer edges (this step), but even so, there will still be many options. In the end, there may be no single 'perfect' net, but a few, or even many, nets each of which is as good as the other.



Example 1
This is the net for a truncated trapezium. Here there are no variations that would look significantly different.

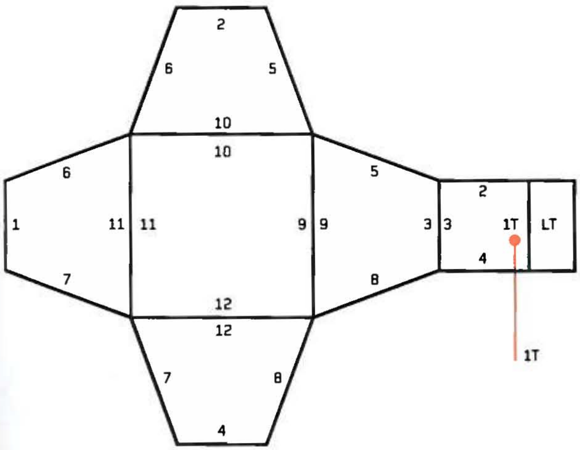


Example 2
The two hexagons can be joined to the line of six rectangles in many different places. These positions are all as good as each other, but with the net shown here, edge 9 touches the other edge 9 where the lid joins the rectangles. This means that if the box is printed on (which is perhaps likely), the printed image has the benefit of being continuous around the 'front' of the box.

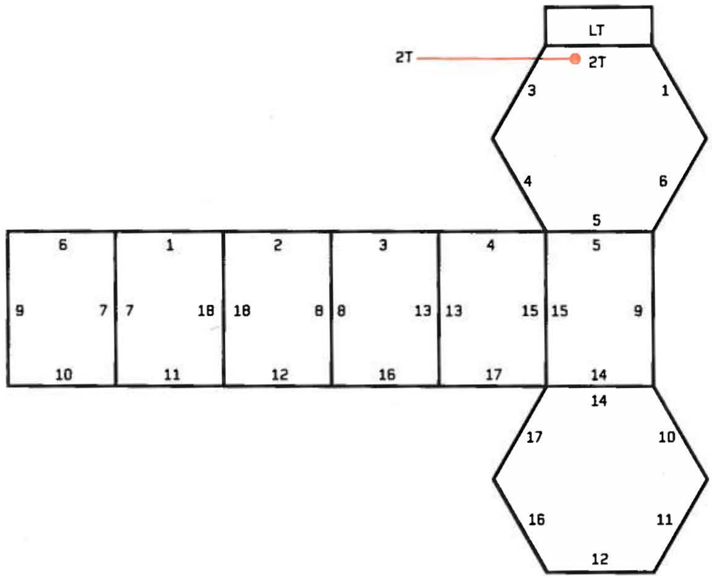
Step 8:

Adjacent to the number, write a T (for tab) near the edge of the lid next to the lid tab.

This simple step begins the identification of which edges should be tabbed and which should remain untabbed. Write the T clearly, next to the number that has already been written.



Example 1

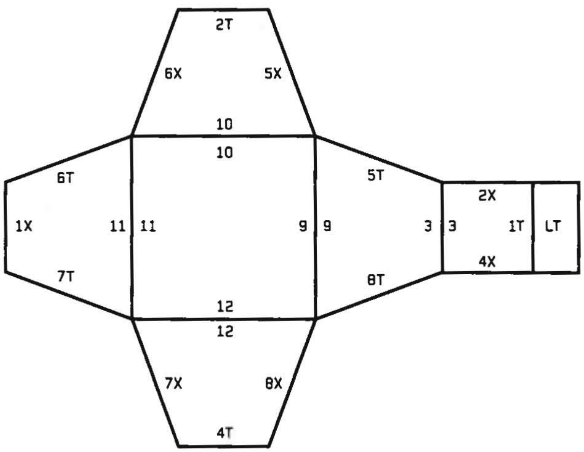


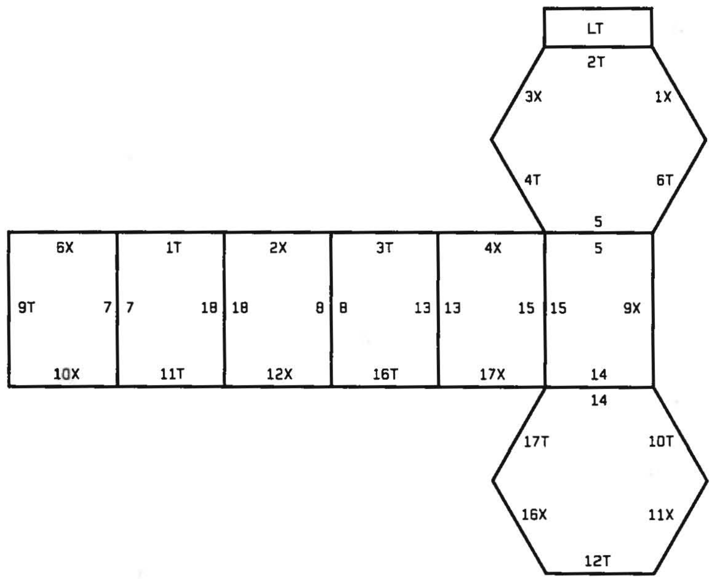
Example 2

Step 9:

By marking each edge around the perimeter with a T or an X, the net can be prepared for tabbing. The first T has just been written, so write an X on the next section of the perimeter, then T again, then X again ... Continue with the T-X-T-X pattern until all the perimeter has been lettered. Write the letters next to the existing numbers.

On the edge adjacent to the lid tab (which has previously been marked with a T), write an X next to the number. On the next edge write a second T, then on the next edge write a second X. Continue around the perimeter marking every edge with alternate T and X symbols, to create a T-X-T-X-T-X-T-X ... etc. pattern around the perimeter. Write the letters alongside the numbers, such as 4T or 7X. If you do it correctly, the last edge you mark will have an X symbol, adjacent to the T symbol on the lid tab, made in Step 8. In this way, the pattern has no beginning and no end. Every net, no matter how eccentric or complex, will have an even number of edges, so the T-X pattern will always work.





Examples 1 & 2
The T-X tabbing patterns are shown complete. If in Steps 4 and 6 you damaged some of the masking tape and compromised the legibility of any numbers, write them again clearly so that everything can be read with ease.

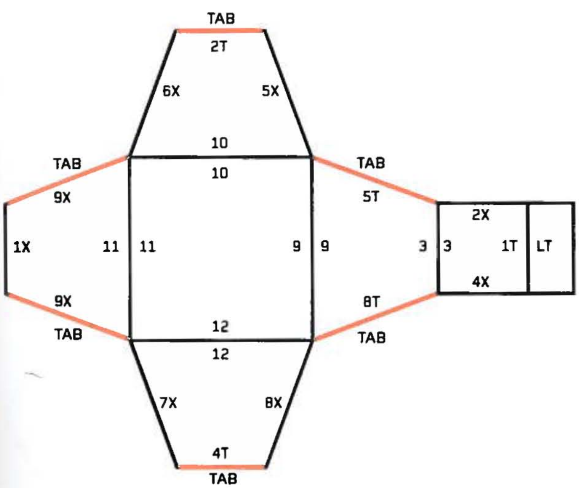
Step 10:

There are two aspects to tabbing a net. The first is the correct placement of the tabs, which is described in this step.

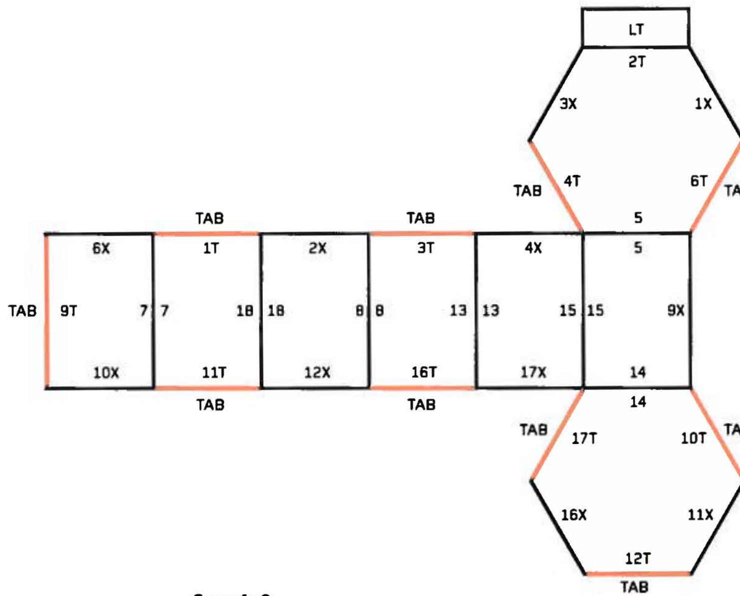
The edge to which the lid tab was fixed was marked with a T. The remaining tabs will affix to all the edges marked with a T. In this way, the tabs are placed on alternate edges around the perimeter.

This is the core of the system for correctly tabbing any volumetric form. Two or more tabs are never placed adjacent to each other, nor are there ever two edges or more between tabs. Providing the net has been correctly made in the preceding steps, the tabs will automatically be placed in the correct positions to lock together in the strongest possible way, when any volumetric form is folded up from one piece of card.

The positioning of the lid tab dictates the position of every other tab. However, if there is no lid and therefore no lid tab, the tabs could equally well be placed on all the X edges as on all the T edges.



Example 1



Example 2

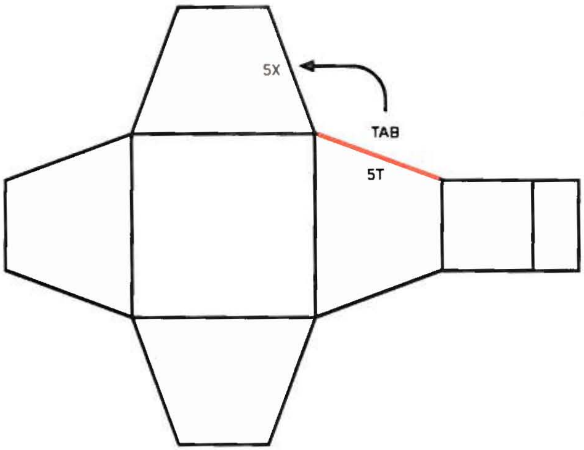
Step 11:

The second aspect to correctly tabbing a net is defining the shape of each tab. Consider each number pairing made in Step 3. It will be seen that around the perimeter of the net each pair has one T number and one X number, such as 4T and 4X. In step 10 a tab was placed on each T edge. When folded up, the tab on edge 4T will slide inside edge 4X. Thus, the tab on edge 4T must be the same shape as the face beyond edge 4X. This principle applies to all the number pairs on the perimeter.

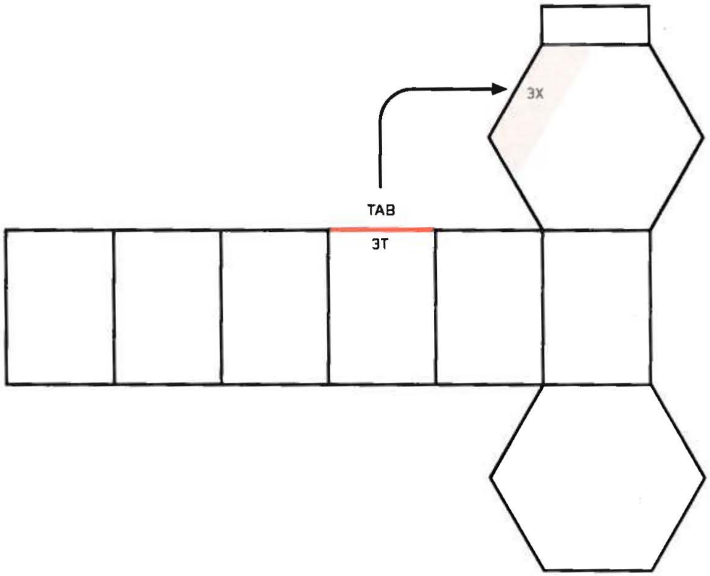
If the first aspect (Step 10: the placement of the tabs) is simple to understand, this second aspect (the shape of the tabs) is perhaps more subtle. The shape of each tab must be decided individually. There is no quick way to do this – every tab must be designed carefully and accurately, one at a time.

Here is the method, step-by-step.

11.1
The tab that will join to the T edge must be the same shape as the face beyond the corresponding X edge. If necessary, measure the angles of the face at the ends of the X edge, as this will determine the shape of the face and, later, of the tab.

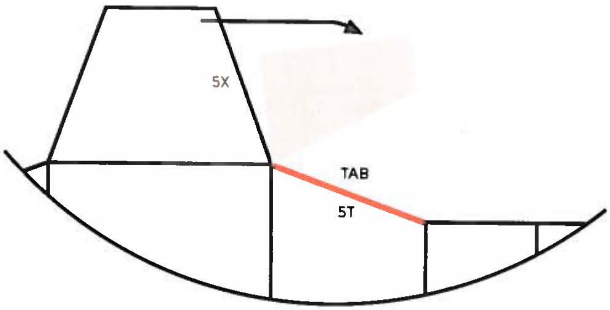


Example 1

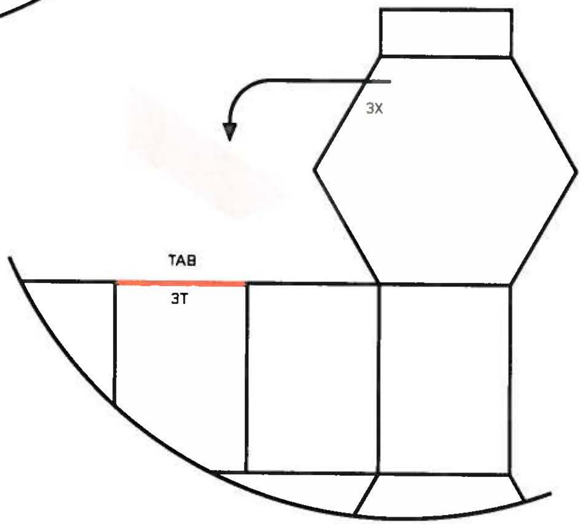


Example 2

11.2
This is not a step, but a graphic to help you visualize how the shape of the face beyond the X edge joins to the T edge to become the tab. In both examples, the face is seen floating away from its position beyond the X edge, towards its location on the corresponding T edge.



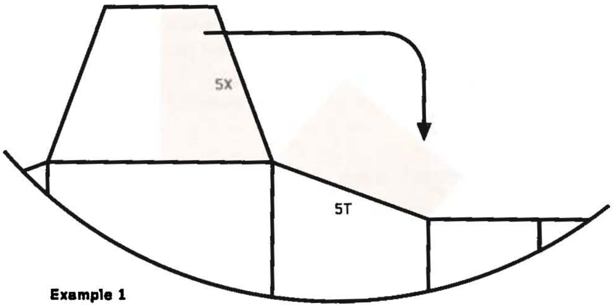
Example 1



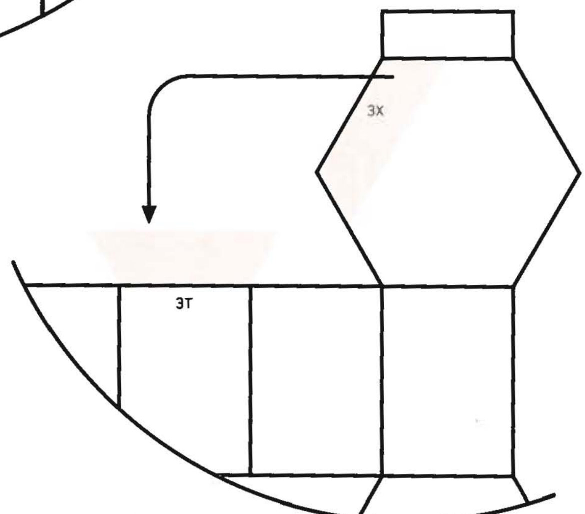
Example 2

11.3

This is the face from beyond the X edge, now copied on to the corresponding T edge as the tab.

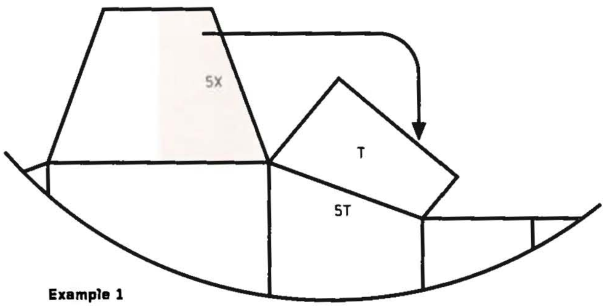


Example 1

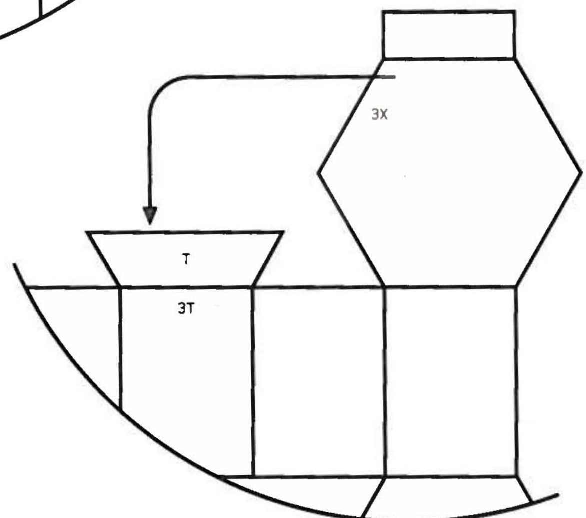


Example 2

11.4
Cut out the shape of the tab from card and affix it securely to the T edge with masking tape, front and back. Notice that the tab is cut quite deep, not thinly. Check that when the 2-D net is folded up to make a 3-D package, the tab will fit exactly into the face beyond the X edge. If it doesn't fit, simply remove the tab and remake it.



Example 1

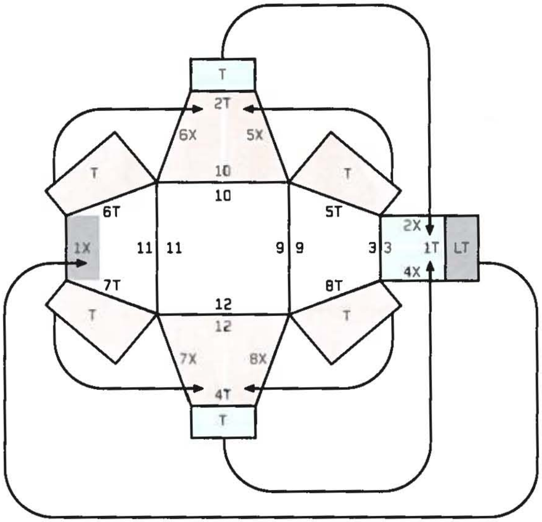


Example 2

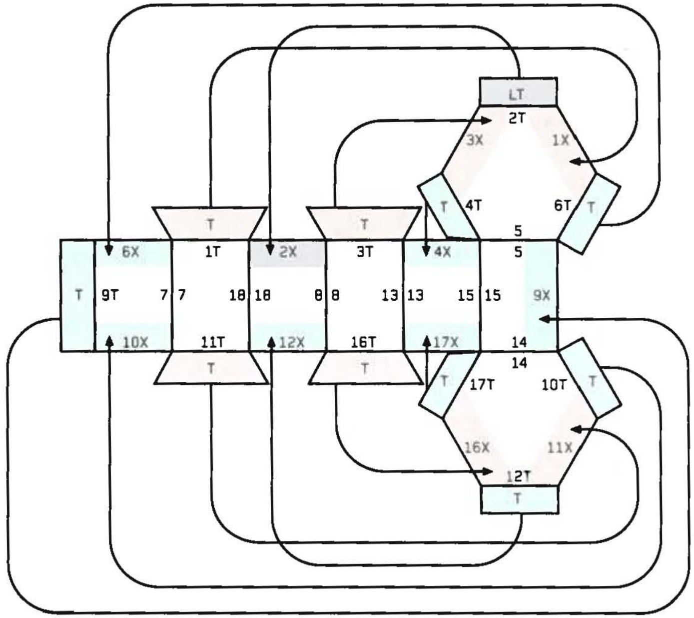
11.5

Repeat the same procedure with all the remaining tabs. If the box is complex with many different lengths and angles, this may be a lengthy procedure, but it is vital to do it methodically and accurately. Take your time.

This step is the core of the net construction system. Followed with 100 per cent accuracy, it creates a net of remarkable strength. Done with even 99 per cent accuracy, the net will be weakened. A net is either absolutely correct and perfect, or incorrect and in need of correction. In design, the concept of perfection is almost unknown – how can a magazine layout, or a colour, or a choice of fabric be described as perfect? – but in package design perfection is achievable and necessary.

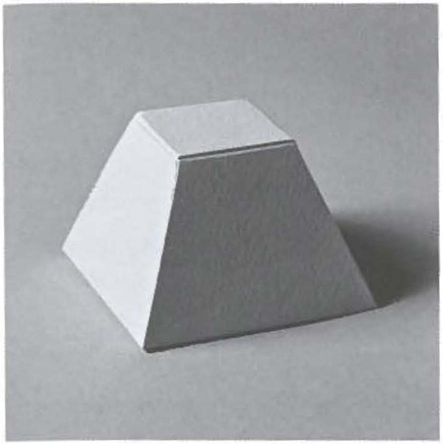


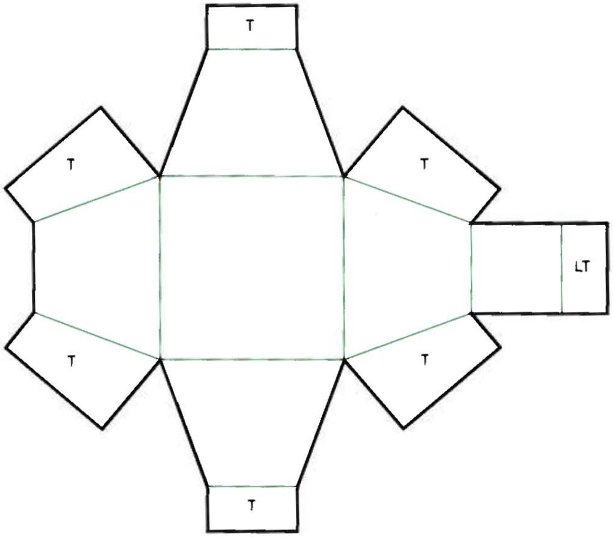
Example 1



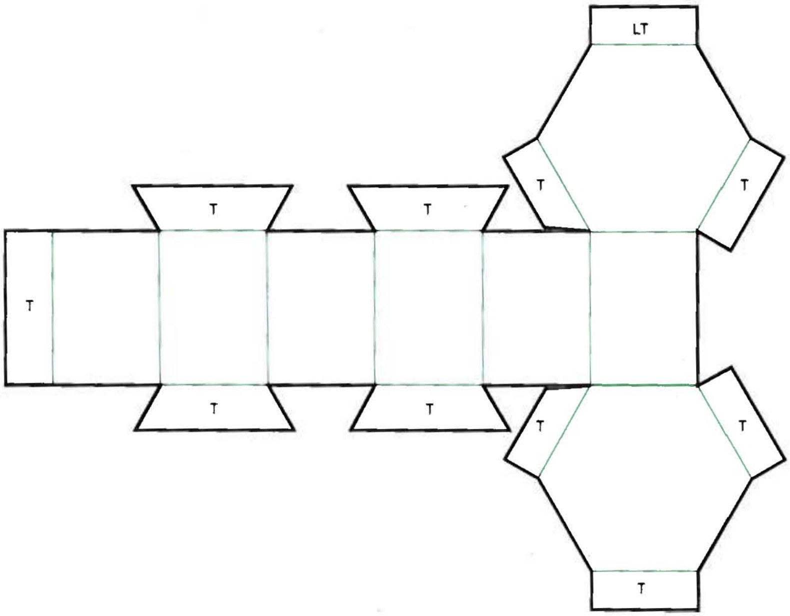
Example 2

11.6
This is the completed net. When all the separate tabs have been checked for accuracy and you are confident that you have created an accurate collage of your design for a package, it can be remade from one sheet of card.





Example 1



Example 2

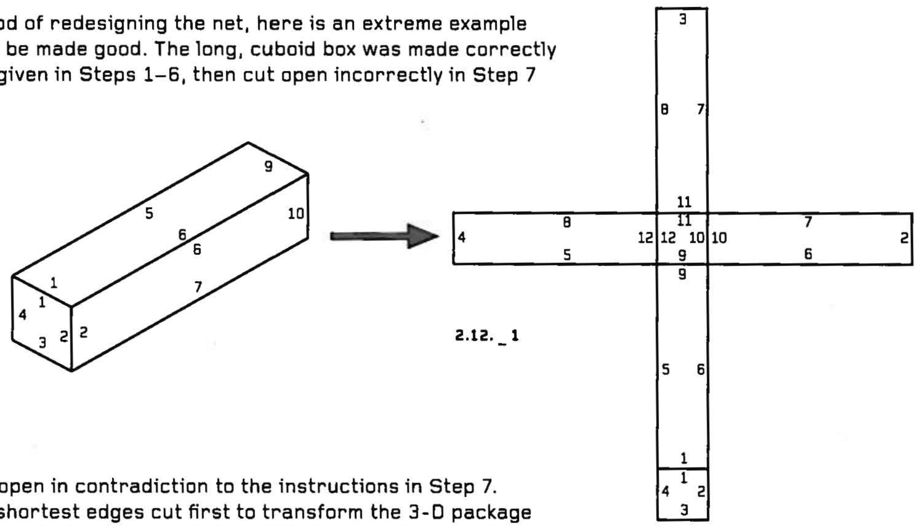
2.12 Troubleshooting

The method described in the previous pages is very precise and must be followed accurately. Any deviation will weaken the final net. While following the steps, it is possible to make small mistakes which compromise the strength and integrity of what you are designing. Here, then, are answers to some common problems.

Q: At Step 7, I cut my package flat, but made a poor net. What should I do to improve it?

A: In truth, at Step 7 many nets will need a little improving and this must be done before progressing on to Step 8. The way to improve a net is to redesign the arrangement of the faces.

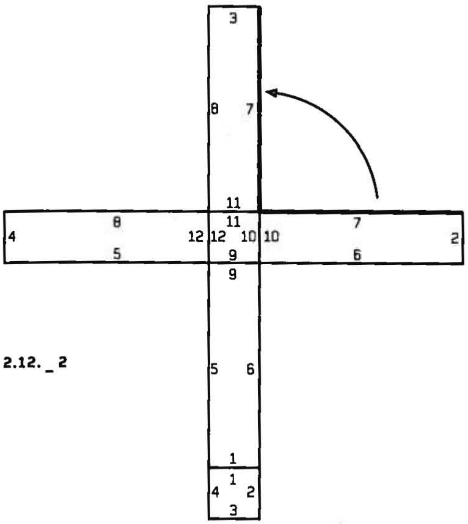
To illustrate the method of redesigning the net, here is an extreme example of how a poor net can be made good. The long, cuboid box was made correctly following the method given in Steps 1–6, then cut open incorrectly in Step 7 to make a flat net.



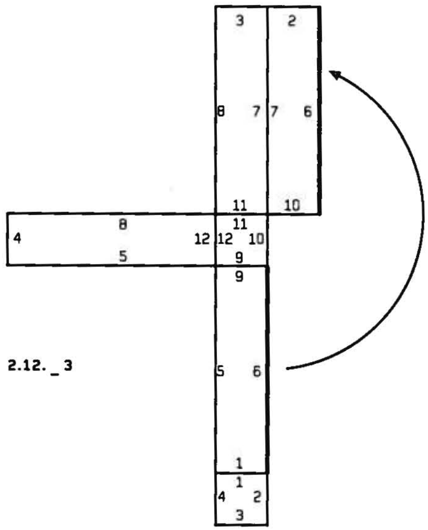
2.12._1

The box has been cut open in contradiction to the instructions in Step 7. Instead of having its shortest edges cut first to transform the 3-D package into a 2-D net, the longest edges were cut first. This has created a net that is fragile and which occupies a very large rectangular area of card, much of which will be wasted. The package made from this net will therefore be weak and expensive.

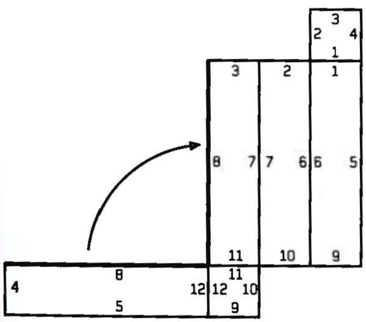
The following sequence shows how faces can be cut from the net and rejoined at better places. The intention is to join together as many of the longest edges as possible, to create a net with as many of the shortest edges as possible around the perimeter. To do so will create the strongest possible package from the minimum rectangular area of card, thus maximizing the strength and minimizing the cost of the design.



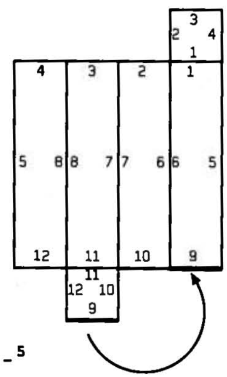
2.12._2



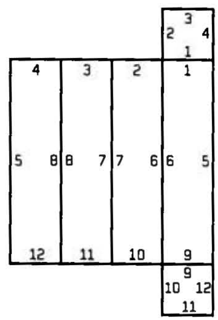
2.12._3



2.12._4



2.12._5



2.12._6
The net is now maximized for strength and compactness and can be tabbed according to Steps 8–11.

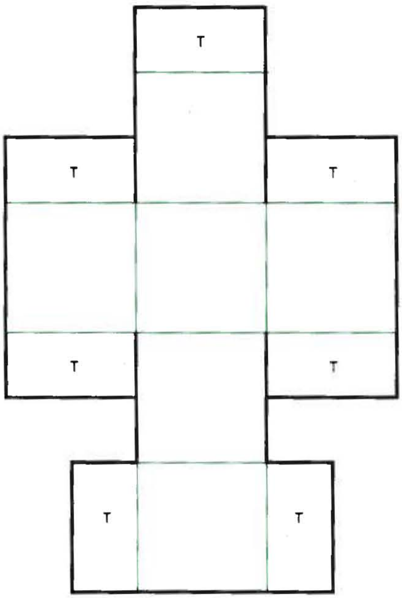
Q: I have followed the steps correctly, but my package will not lock. What can I do?

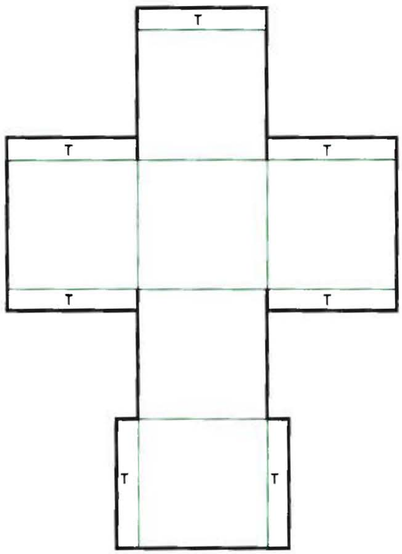
A: There are several possible reasons for this. Any one of them, or perhaps a combination of two or more, may be the cause.

1. Is it made well?
A poorly made package will not lock. Check that the faces and the tabs are precisely made and that everything has been cut or folded with accuracy and attention to detail. Check, too, that the card is not too thin or too thick (250gsm is the weight used in this book, though you may eventually wish to use something heavier) and that the folds are not too floppy and without strength.

2. Are the tabs deep enough?
A package will hold together without glue because the tabs fit snugly inside. The side edges of each tab rub against the inside of a folded edge, so the longer the side edges are, the more grip the tabs will have and the more strongly the box will hold together.

Here are two good nets for a simple cube. The net with the deep tabs will be considerably stronger than the net with narrow tabs. It is conceivable that the latter will not hold together.

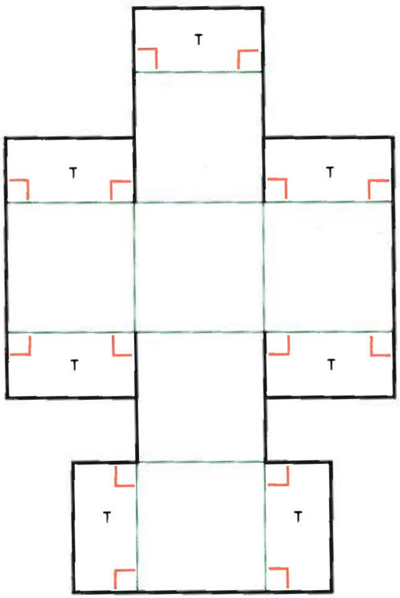


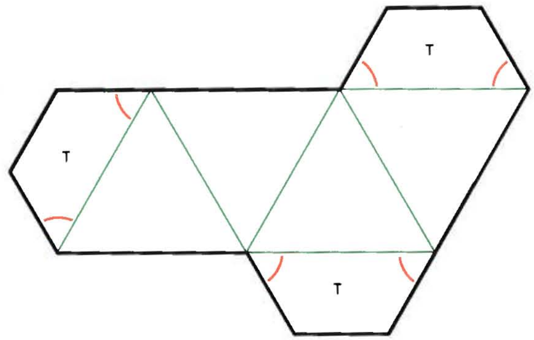


3. Tapering tabs

In the examples below, the 90° tabs will lock the cube very strongly. However, the tapering 60° tabs will not lock the tetrahedron, although they are correctly positioned and correctly shaped.

There are three remedies to this problem:



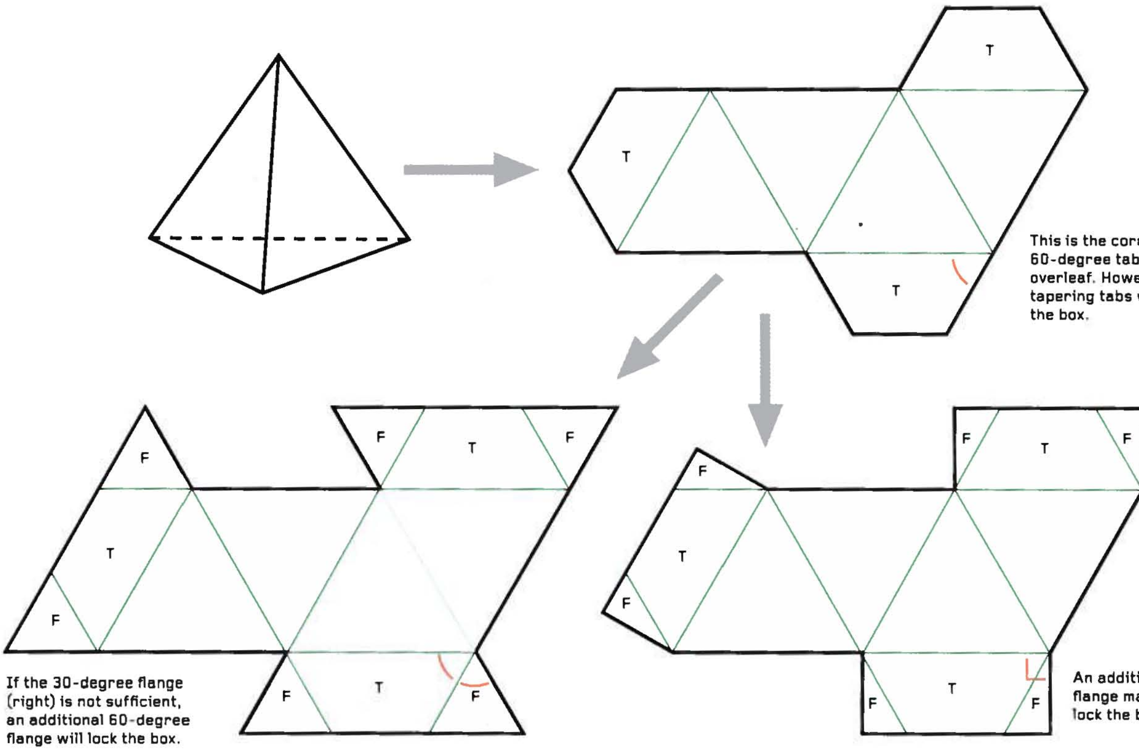


Remedy A

Glue the tabs! While totally possible, this is not the recommended method. Remedies B and C offer better solutions.

Remedy B
Add flanges to the edges of the tapering tabs. A flange is an extra piece of card joined to the side of a tab that has a corner of less than 90°. Adding flanges will help to hook the tab around others inside the package, and so lock the tetrahedron securely together.

Here is an example of a simple three-sided pyramid, known in geometry as a tetrahedron. Following the steps above, a simple net is made with three tapering tabs of 60°. These tapering tabs will not lock the tetrahedron together, so flanges need to be added. The size of the flanges will depend on the size of the package and the weight of the card. It may be enough to extend the tabs only by an extra 30°, so that they become 90°, or perhaps by an extra 60°, so that they become 120°. It is better to make the flanged tabs 120° rather than 90°, and to trim off any excess. Too big is better than too small.



This is the correct 60-degree tab shown overleaf. However, these tapering tabs will not lock the box.

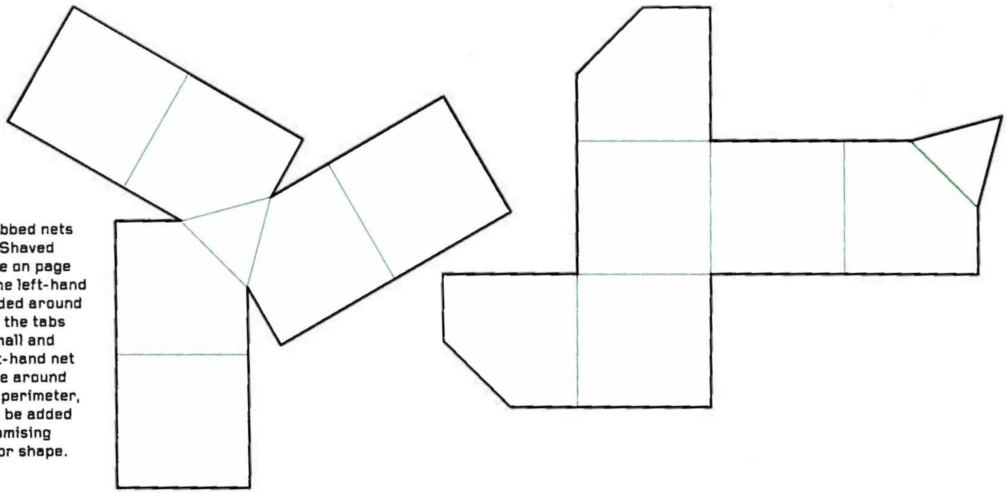
If the 30-degree flange (right) is not sufficient, an additional 60-degree flange will lock the box.

An additional 30-degree flange may be enough to lock the box.

Remedy C
Add a Click Lock (see page 70) to each 60° tab. This is a simple, secure lid lock, found on many mass-produced cuboid boxes. It will also securely lock tabs that taper.

Q: I have no space on my net for some of the tabs. Where can I put them?

A: With complex nets it is quite common for sections of the perimeter to become so crowded in a few places that it is impossible to create tabs that are wide enough and deep enough to be effective. In these instances, the solution is to follow the answer to the first 'Troubleshooting' question (see page 32) and move the faces around on the flat net. Remember to keep the longest edges connected and to keep any lid tab in the correct place. Never omit a tab or leave it unchanged knowing it is incorrect and in need of improvement.



These two untabbed nets both make the 'Shaved Corner' example on page 56. However, the left-hand net is too crowded around the triangle, so the tabs there will be small and weak. The right-hand net has ample space around all parts of the perimeter, so the tabs can be added without compromising their strength or shape.

Q: Almost all my edges are the same length. In Step 7, which should I cut first and why?

A: If you have a wide choice of edges to cut, consider these criteria to help you narrow your options.

1. Cut open the net to make it occupy as compact an area as possible. This will consume less card and make the package less expensive to manufacture.

2. Cut open the net to leave ample space for all the tabs (this is the answer given above on this page). This will make the package stronger.

3. Cut open the net in a symmetrical way, rather than in some random configuration. This usually helps to make the net stronger and more compact.

4. Keep certain key edges connected so that if the surface is printed on, this can be done without interruption, across the folds connecting one face to another. This will improve the appearance of the surface graphics.

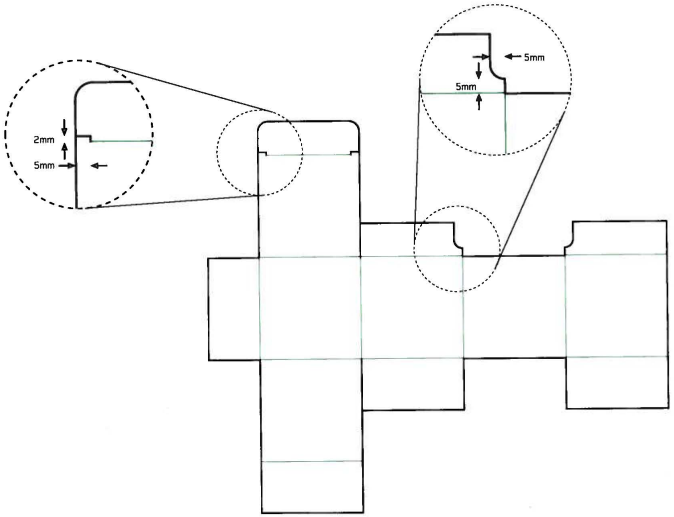
Click Lock

The Click Lock is one of the uncelebrated minor miracles of design. It is very simple to make and strengthens enormously the locking of a lid into the body of a box. Such is its strength that, well made from card of just the right weight, it can lock so securely that the lid will open only if the card is ripped!

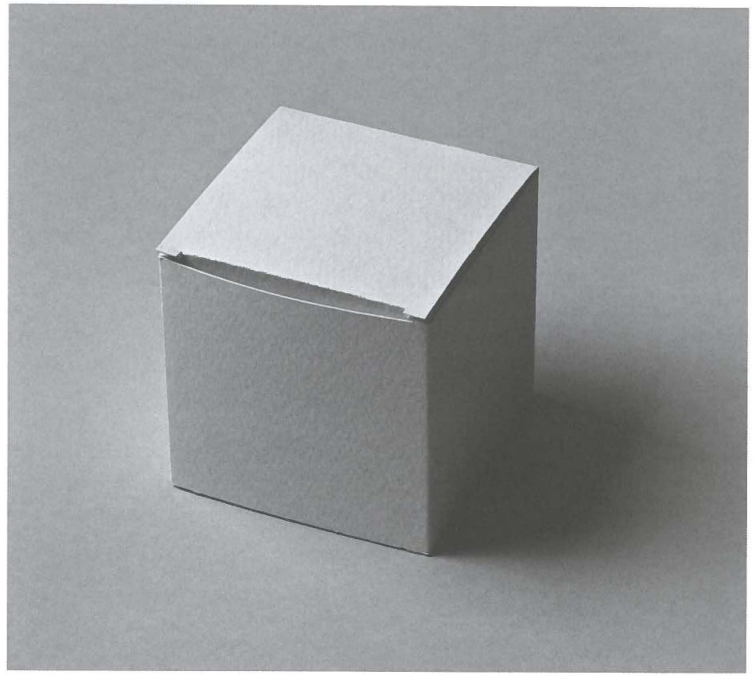
It is generally used only on smaller packages made from lighter weights of card or board that contain items of no great weight. It can be opened and closed many times without damaging the box, so it is often incorporated on packages that need to be accessed frequently, such as boxes for paper clips.

Although admirably simple in design and use, the Click Lock must be made precisely. Please follow the measurements given below very accurately. The dimensions of the lid and the lid tab are unimportant, but it is crucial to use the 5mm and 2mm measurements given, not to scale them up or down.

The Click Lock may also be used for the base of the package. However, you need to be very sure that when the box is picked up, the lock will be strong enough to prevent the contents falling through.



A Click Lock is particularly useful in locking a lid tab – or any other unglued tab – that tapers (that is, a tab with corners of less than 90°). A design consisting of many tapering tabs that tuck into triangular or tapering faces will not lock securely. Adding Click Locks to these non-lid tabs will lock them in.

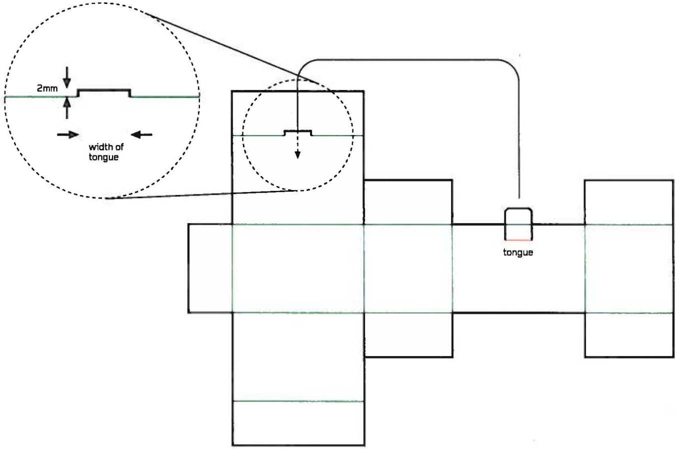


Tongue Lock

The Tongue Lock is the ultimate in secure, non-glued closures. If you are designing something that may possibly be subjected to a lot of handling, it should be used in preference to the less secure Click Lock. Similarly, it should be used in preference to the Click Lock for larger packages made from corrugated board that will contain heavy items.

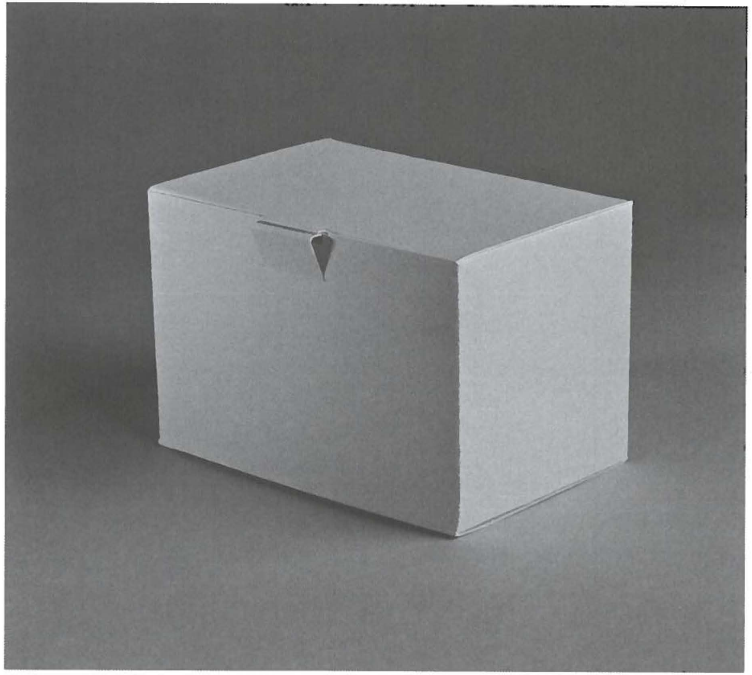
It can also be used in place of a glue tab to hold together very securely edges that are not intended to be opened.

For non-packaging designs that you want to look as geometric and as pristine as possible, consider using a Tongue Lock to hold a long, raw edge of the net to the tab beneath, thus straightening an edge which may have a tendency to bow in an unsightly manner. For extra-long edges which need securing, two or more Tongue Locks may be used.



The construction is simple. The tongue and the slit are the same width. The slit projects forwards into the lid tab by about 2mm. If corrugated card is used, the slit may need to protrude more depending on the thickness of the material. The letter-box opening beneath the slit will become apparent only when the lid tab is folded through 90° (there is no apparent opening when the card is flat).

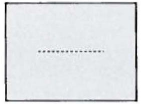
A Tongue Lock can be combined with a Click Lock on the same lid.



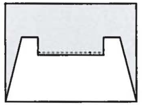
Crash Lock

Whereas the Click Lock and Tongue Lock are locks to secure a lid, the Crash Lock secures the base of a package. By dividing the base into four sections then interlocking them in a simple but ingenious way, the base is not only secured, but strengthened – a Crash Lock base can hold more weight than a single-layer Click Lock or Tongue Lock base.

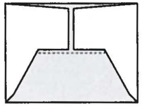
The Crash Lock is suitable for any rectangular base, or for any quadrilateral with or without 90° corners. There are interesting variations for five- and six-sided bases.



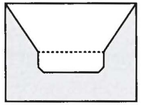
5.4.1
The shaded rectangle is the shape of the base. Draw it carefully. Draw a line parallel to the long edges partway across the middle. Its length should be about 50 per cent of the length of the long edge, perhaps more.



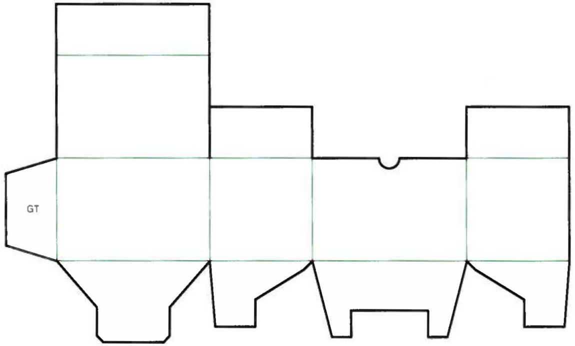
5.4.2
Joined to a long edge, draw the shape shown here. The exact shape and size of the two teeth are unimportant, but it is important to run the horizontal edge just a little below the centre line drawn in 5.4.1.



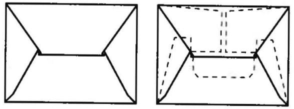
5.4.3
Joined to the short edges, draw two mirror-image tabs. Note that the horizontal edges are just a little above the centre line drawn in 5.4.1.



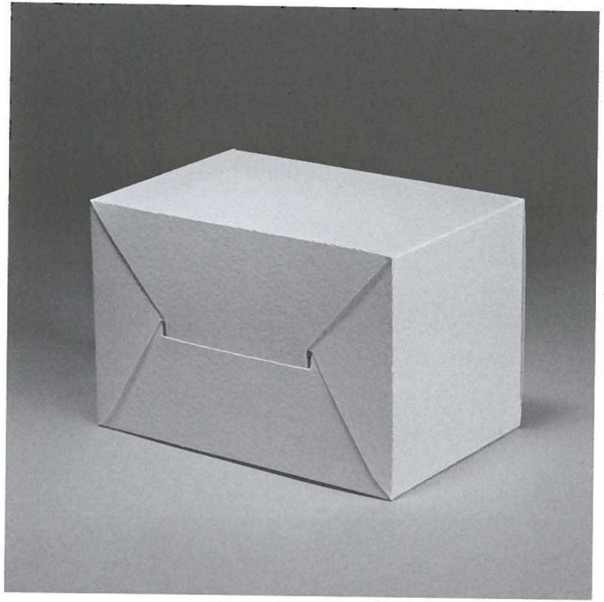
5.4.4
Joined to the top edge, draw the shape shown here. Note that the long sloping edges connect the top corners of the base rectangle with the ends of the line drawn in 5.4.1.



5.4.5
The four tabs can now be drawn on the net of the package, in this configuration. Note that the tab made in 5.4.4 (the tongue) is adjacent to the glue tab at the left-hand edge of the net.



5.4.6
This is how the Crash Lock looks when the four tabs are interleaved. First fold in the tab made in 5.4.2, then the two smaller side tabs, then finally the tongue tab, tucking the tongue through the slot across the middle of the base.



This is the base of the Crash Lock. To show how the four sides of the card interleaf, the length of the vertical slits each side of the slot have been exaggerated. In reality, they should be tight shut.