

THE HOWARD WAY LETTER

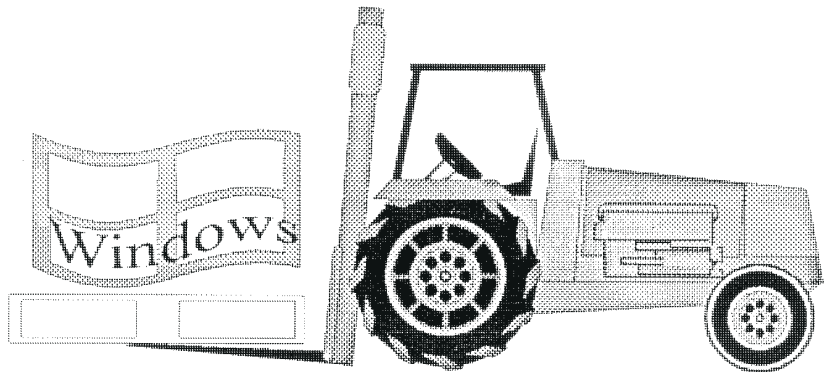
A guide for improving productivity in warehousing and distribution

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A Window on Space II

Many years ago, Howard Way and Associates developed a system of logic to optimize the selection of Space II. It was called Space I and was way ahead of its time. Some time later an associate transferred the logic to microcomputers. Part of the deal was that Howard Way and Associates would have lifetime use of the new program. Well, they developed an easy to use and valuable tool to optimize storage space, reduce handling, reduce the capital investment in pallets and even improve truck loading and transportation costs. Now that is one handy tool and you would think that by now, everyone in the world would already be using it to accomplish those admirable goals. Not so! There are a



number of applications for this type of tool that are just not being used.

Well readers, the whole concept just got simpler and cheaper, as well. We are presenting an old friend in a brand new format that we think is really worthwhile. Flex Systems, in Greendale, Wisconsin, the programmers of Space II has just delivered the final copy of *SPACE II*, a pallet pattern calculator for windows. It looks really good and it can be very useful to the warehouse professional. We will outline the operational details and show you a few ways that this powerful little program can help

you. If you use Windows, the use and installation will be almost trivial but we will err on the side of caution and walk you through all the details of operation.

WHAT IS SPACE II?

The pallet pattern calculator (Space II) is a program that uses mathematical and logical principles to interactively help to find the optimal arrangement of cases on a pallet. The basic goal is to maximize the use of the pallet area as well as to maximize the number of layers on the pallet. The original approach entailed punch cards and a look up listing that correlated

with a printed pattern set. The routine took a week and cost upwards of \$1000 each time it was run. Nevertheless, it was worth every cent it cost. When the PC version came out, it cost about \$600.00 and ran in DOS. The printouts were less than beautiful but suddenly the operator could interact with the program. This allowed "on the spot" changes to see the effect of different pallet sizes, case orientation and weight constraints.

Now, the program is in Windows, is much less costly and the graphics are great!

If you are really interested in the underlying logic, we suggest that you see Howard Way Letter Volume II (that's right, 15 years ago!), "Space II, Logic and Theory". For now, let's assume you are more interested in results than theory.

What Can It Do?

"Space II" is able to generate all of the possible patterns for stacking cases on a pallet of any size. It lists the various options, indicates the number of cases per layer, the number of layers high, the total number of cases on the pallet, the total weight, the percent utilization of the pallet area, and the per cent of utilization of the cube enclosed by the pallet dimensions. If the operator knows the cost of a pallet position, the program will even calculate the cost of storage per case for each solution!

The program highlights the options that indicate the greatest efficiency and can print out a picture

showing the true pattern to approximate scale

Along each side of the sketch is a list of the lengths and widths for that side. Given this diagram, any warehouse worker can quickly and easily duplicate the pattern with real cases. When setting up a run for a particular pallet size and case size, it is possible to place limits, or constraints, on the total weight of the pallet as well as on its total height. This makes it easy to fit present conditions or to decide on future configurations of rack opening height or load beam weight rating. Furthermore, when a pattern is affected by weight, an asterisk appears next to the listing, so that the allowable weight may be changed in order to utilize the cube more completely. The actual length and width of the pallet are also constraints, as the program will not allow overhang unless the pallet dimensions are changed to account for it. For example, a 48" x 40" pallet would be entered as 50" x 42" to allow for a total two-inch overhang of the 48" x 40" pallet.

Optimizing

An actual example is shown as Figure 1, How To Improve Cases Carried Per Pallet. We have used a very simple carton size of 12 inches long x 8 inches wide by 8 inches high, weighing 10 pounds, placed on a 48 inch by 40 inch pallet with no overhang.

The constraints set up are that the maximum load cannot exceed 2500 pounds and the load height not counting the pallet itself may not exceed 56 inches. We entered an arbitrary description as,

"printed business forms" and a cost per pallet storage location of \$38.75.

All of the various input data are entered in the "setup" screen shown in Figure 1. The results as shown on the "list" in Figure 1 show that there are 28 possible patterns of which 5 appear as optimal. Weight was not a limiting factor so there are "0" overweight patterns. If weight was the limiting factor, an asterisk would show next to the pattern listing.

Which Is Best

There were five patterns that could be considered optimal. The lightly highlighted line in the "list" portion of Figure 1 shows merely where the cursor was resting. In an actual screen, that would show as a different color.

Of the three pattern sketches shown, a simple logical analysis helps to choose the best.

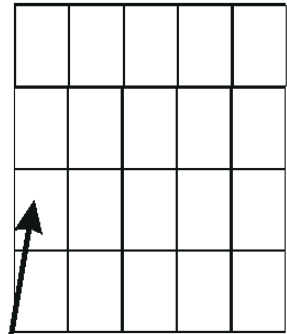
Obviously, Number 6, The multiblock solution only has 19 cartons per layer for a total of 133 cartons per pallet.

Either of the other two shown (Number 11 or Number 2) are preferred from the standpoint of efficiency. Both have 20 cartons per course and 7 courses for a total of 140 cartons per pallet. However, pattern #2, "Unitblock" has no interlock to help hold the pallet together. Interlock is when each course is reversed from the one before and the cartons interlock. For this reason alone, Pattern Number 11, "Pinwheel" is the best. Pinwheel and irregular patterns are

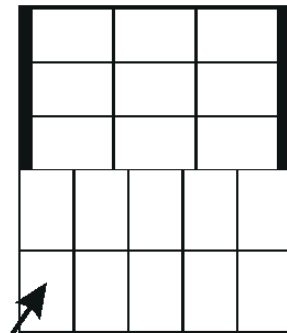
Setup

Pallet		Carton	
* Load Area Length	48	Length	12
* Load Area Width	40	Width	8
Maximum Stack Height	56	Height	8
Maximum Load Weight	2500	Weight	10
* (including overhang)			
Optional			
Storage Cost per Pallet	38.75	<input type="button" value="List"/> <input type="button" value="Help"/>	
Description	Printed business forms		
How to Use			
Move between fields with Tab (or Enter) and Shift-Tab.			
Fill in the Pallet, Carton, and Optional information, then click List.			

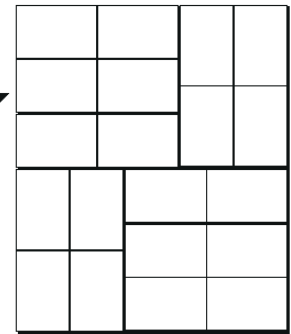
Entry Data Screen



Pattern # 2, UnitBlock
20 per course, 7 courses
140 cases note: no lock



Pattern # 6, Multiblock
19 per course, 7 courses
133 cases



Pattern # 11, Pinwheel
20 per course, 7 courses
140 cases , Good Interlock

List

Patterns	No.	Pattern Type	Cartons per Course	No. of Courses	Total Cartons per Pallet	Total Weight	Stack Space Utilized
Patterns	28	1 Unitblock	18	7	126	1,260	90 %
Optimal	5	2 Unitblock	20	7	140	1,400	100 %
Overweight	0	3 Multiblock	20	7	140	1,400	100 %
		4 Multiblock	18	7	126	1,260	90 %
		5 Multiblock	18	7	126	1,260	90 %
		6 Multiblock	19	7	133	1,330	95 %
		7 Multiblock	17	7	119	1,190	85 %
		8 Pinwheel	18	7	126	1,260	90 %
		9 Pinwheel	18	7	126	1,260	90 %
		10 Pinwheel	18	7	126	1,260	90 %
		11 Pinwheel	20	7	140	1,400	100 %
		12 Irregular	18	7	126	1,260	90 %
		13 Irregular	17	7	119	1,190	85 %
		14 Irregular	19	7	133	1,330	95 %
		15 Irregular	19	7	133	1,330	95 %
		16 Irregular	20	7	140	1,400	100 %
		17 Irregular	19	7	133	1,330	95 %
		18 Irregular	19	7	133	1,330	95 %
		19 Irregular	18	7	126	1,260	90 %
		20 Irregular	19	7	133	1,330	95 %
		21 Irregular	20	7	140	1,400	100 %
		22 Irregular	19	7	133	1,330	95 %
		23 Irregular	19	7	133	1,330	95 %
		24 Irregular	17	7	119	1,190	85 %
		25 Irregular	18	7	126	1,260	90 %

How to Use
Optimal patterns are highlighted. Overweight patterns show an asterisk (*). Scroll up or down to any pattern and press Enter (or double-click it with the mouse) to display a picture of the pattern. You may also click Setup to set up a new pallet.

Listing Of Patterns

Figure 1 How To Improve Cartons Per Pallet

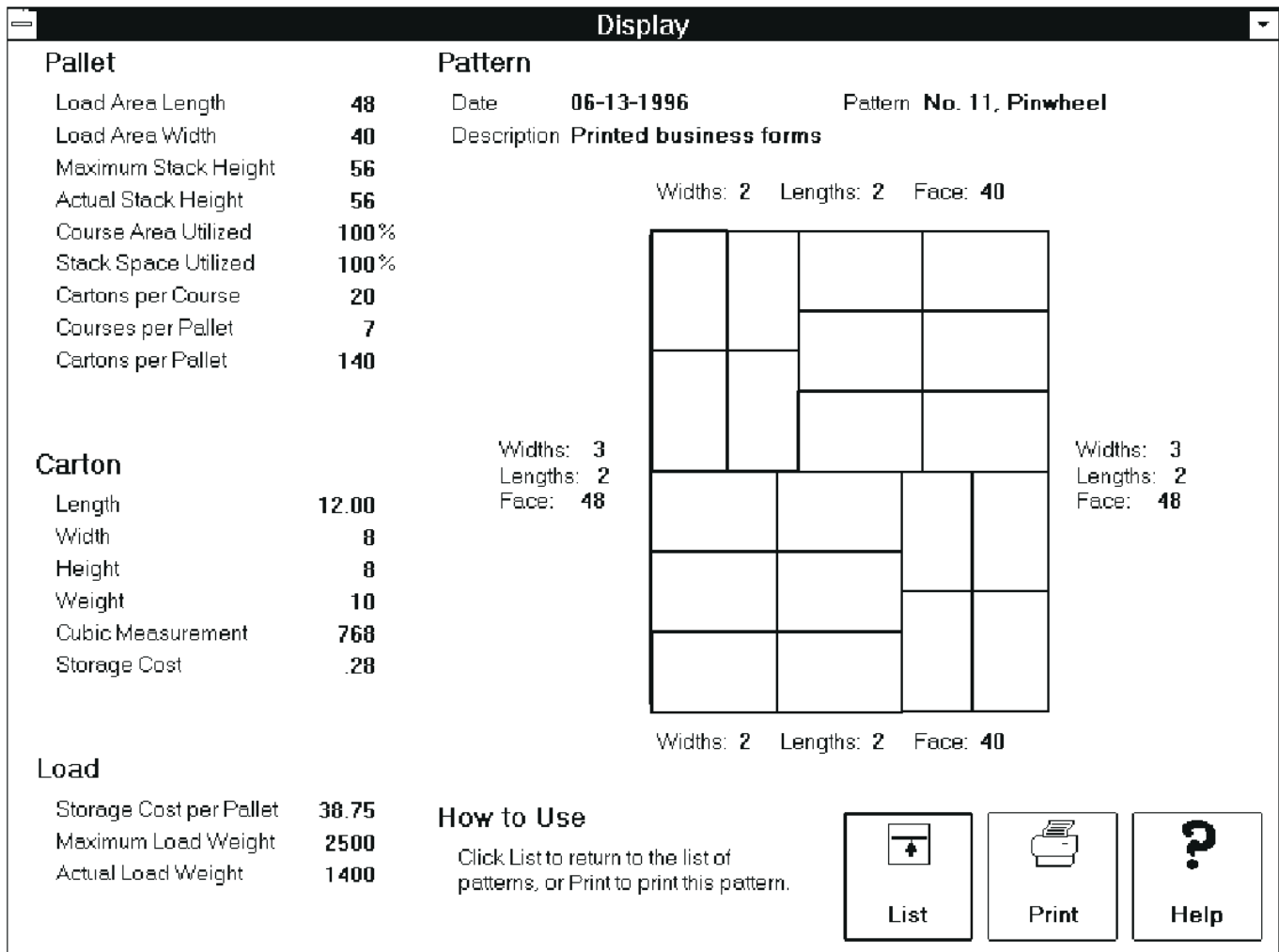


Figure 2 Scale Pattern Diagram Screen

rarely developed with a ruler and a piece of graph paper. They need the computer approach! Please realize that the less obvious irregular patterns may very well hold the most cartons. If an irregular or a pinwheel is your best solution, you can give your palletizing crews graphic printouts that show exactly how to build the pallets. The use of such diagrams is highly recommended even with simple patterns. The reason of course is the achievement of consistent patterns and counts. This will reduce errors in

shipments, make inventory taking easier and generally aid accuracy, space utilization and productivity.

The Display Screen

If pattern number 11 is "double clicked", a scale diagram is generated (See Figure 2, Scale Pattern Diagram) This pattern is a "pinwheel" and to make it even more understandable, the widths and lengths that are on each side are displayed. Detailed information about the pallet and the carton are

also part of this screen on the left side.

Space Efficiency

A calculated "course" area efficiency is displayed and this indicates the relative use of the pallet surface. The Stack usage (height) is also calculated and displayed and is an indicator of desirable changes in allowable pallet height or weight. For example if the course area is not well utilized, perhaps overhang or a different pallet

Pallet Pattern Report

Pallet:		Carton:	
Load Area Length:	48	Length:	12
Load Area Width:	40	Width:	8
Maximum Stack Height:	56	Height:	8
Actual Stack Height:	56	Weight:	10
Course Area Utilized:	100%	Cubic Measurement:	768
Stack Space Utilized:	100%	Storage Cost:	.27
Cartons Per Course:	20		
Courses Per Pallet:	7	Load:	
Cartons Per Pallet:	140	Storage Cost Per Pallet:	38.75
		Maximum Load Weight:	2500
		Actual Load Weight:	1400

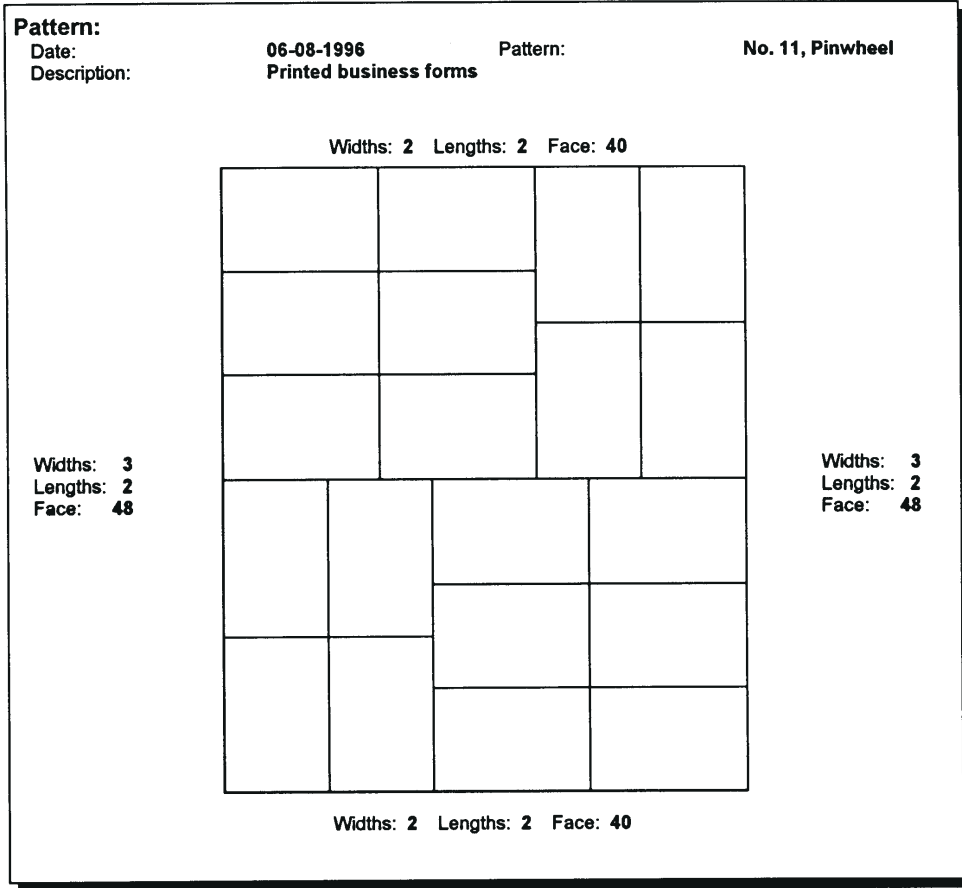


Figure 3 Printout Of Optimum Pattern

size may help. If the stack height is under-utilized, it may be useful to move the rack load beams a small amount to allow another course on each pallet. In either measure, the optimum pallet goal may need a

change in orientation or pallet size to achieve the optimum utilization.

Cost Per Case

If the pallet storage cost is entered on the setup screen, a cost per carton or case will be displayed. This shows the bottom line

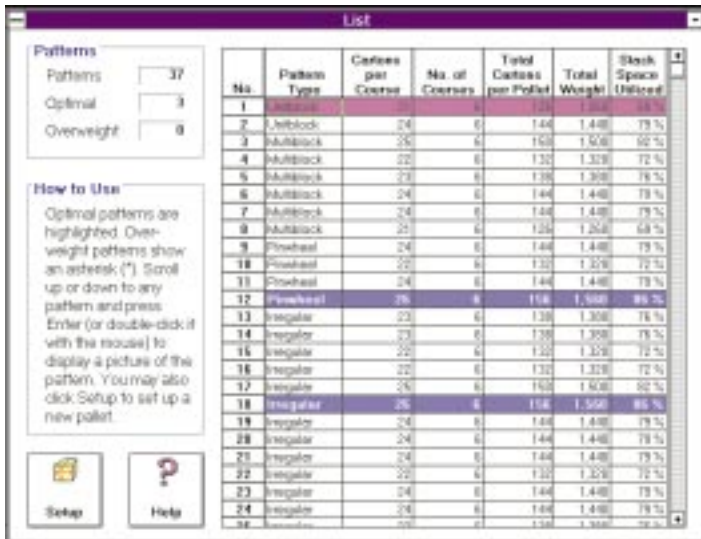


Figure 4 List for "Variation Pallet A"

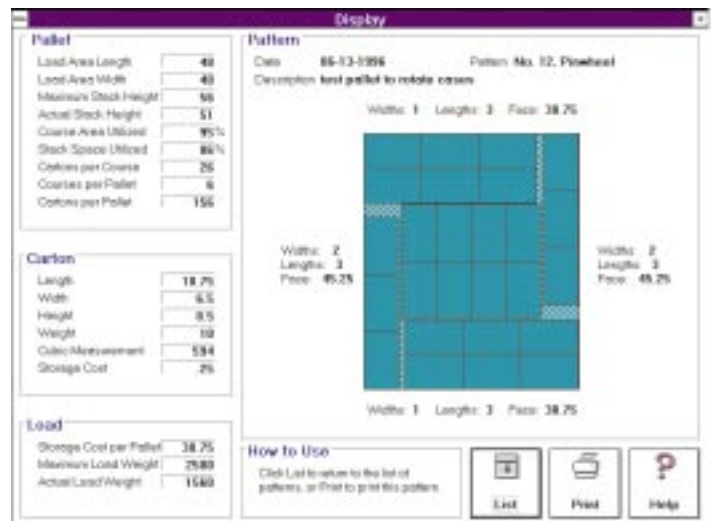


Figure 5 Display For "Variation Pallet A"



Figure 6 List For "Variation Pallet B"

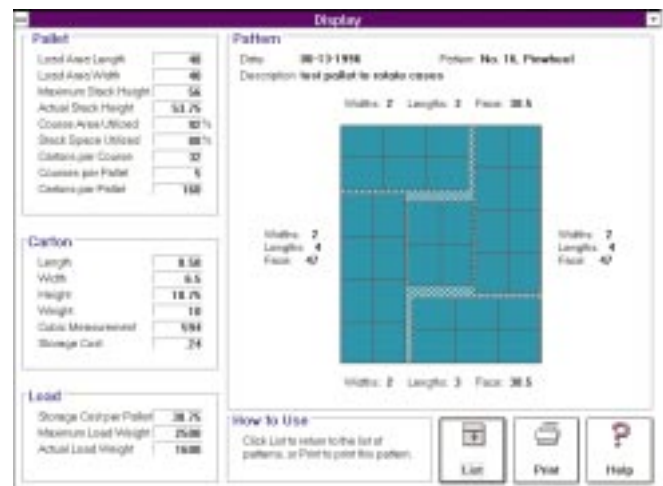


Figure 7 Display For Variation Pallet B"

advantages of pallet pattern improvement.

“the optimum pallet may need a change in orientation or pallet size to achieve the optimum utilization.”

Printout

If the mouse is “clicked” on “PRINT”, a permanent scaled printout (See Figure 3, Printout Of Optimum Pattern) will be obtained. The quality of this print depends of course on the system printer used

for windows. A complete set of laser printouts would be a great addition to any receiving/shipping department.

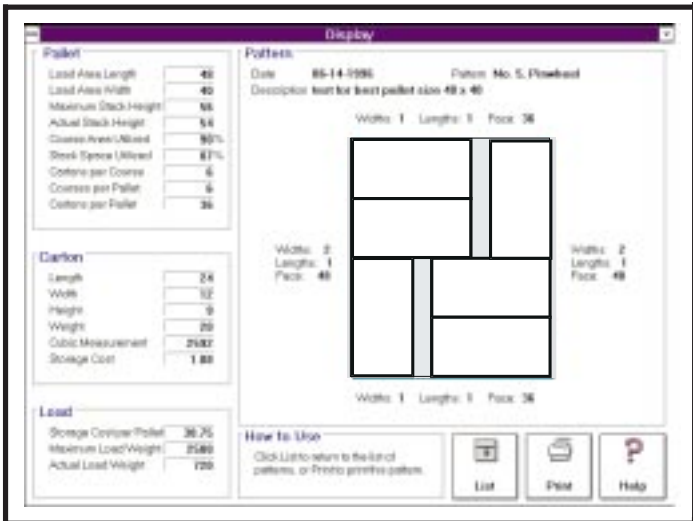


Figure 8 Pallet Size Test 48 x 40

FOOTPRINT = 29.3 FEET, AT THREE PALLETS HIGH, THE AREA PER CASE STORED IS 29.3 FEET DIVIDED BY 108 CASES = .271 SF PER CASE

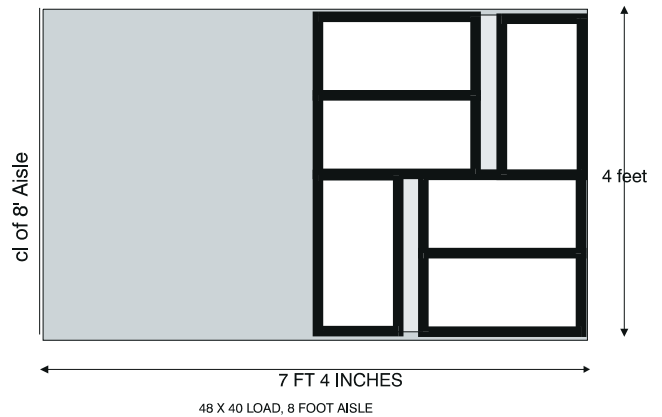


Figure 9 Area Per Load 48 x 40

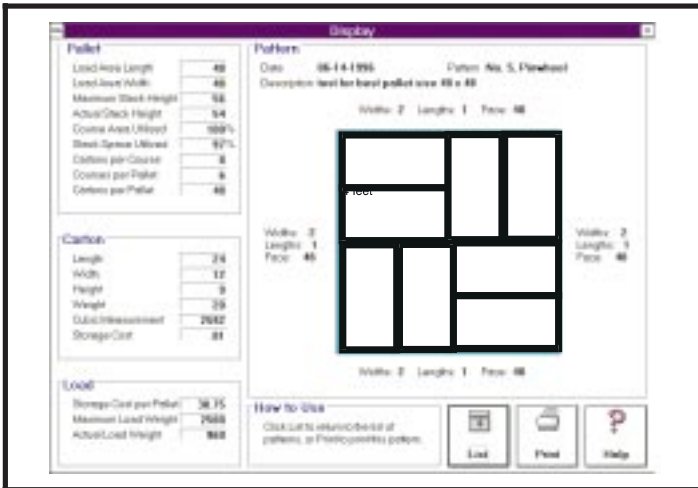


Figure 10 Pallet Size Test 48 x 48

FOOTPRINT = 33 FEET, AT THREE PALLETS HIGH, THE AREA PER CASE STORED IS 33 FEET DIVIDED BY 144 CASES = .229 SF PER CASE

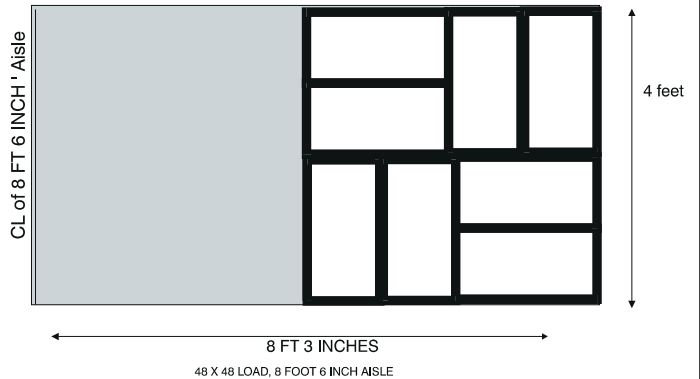


Figure 11 Area Per Load 48 x 48

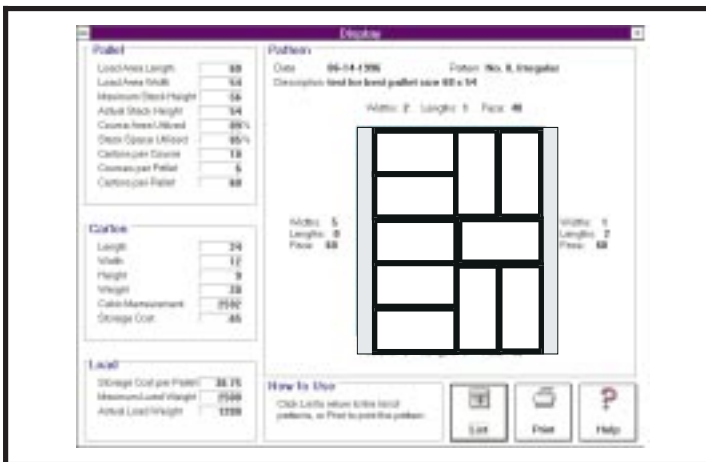


Figure 12 Pallet Size Test 60 x 54

FOOTPRINT = 45 FEET, AT THREE PALLETS HIGH, THE AREA PER CASE STORED IS 45 FEET DIVIDED BY 180 CASES = .25 SF PER CASE

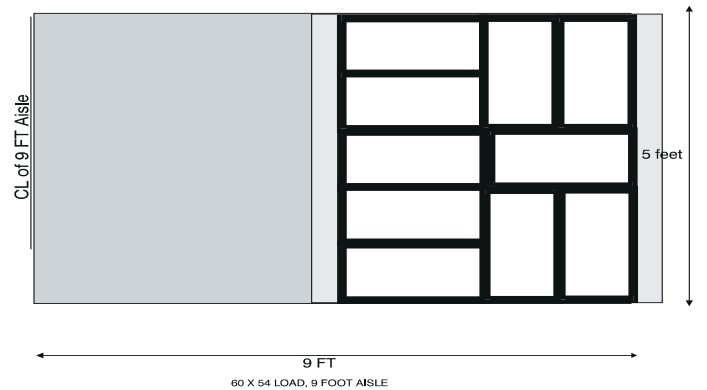


Figure 13 Area Per Load 60 x 54

PALLET SIZE RESULTS						
FIGURE NUMBER	PALLET SIZE	AISLE WIDTH	CASES PER PALLET	CASES IN 3 HIGH	AREA PER CASE	
FIGURE 9	48 X 40	8 FT	36	108	.271 SF	
FIGURE 11	48 X 48	8 FT 6 IN	48	144	.229 SF	
FIGURE 13	60 X 54	9 FT	60	180	.250 SF	

Figure 14 Space Efficiency Of Various Pallet Sizes

Variations

One of the advantages of this software over our original main-frame version is the ability to interact and try variations on a theme to come closer to the right solution. Figure 4 "Variation Pallet A" and the display in Figure 5 illustrate a search for improvement in a different way. All of the variations involve a 48" x 40" pallet and carton dimensions of : 10.75 inches long, 6.5 inches wide, and 8.5 inches high. The best pattern as seen in Figure 5 is a pinwheel with 26 cases per course and 6 courses high for a total of 156 cases per pallet.

If we turn the carton on the pallet so that the length becomes 8.5 inches, the width, 6.5 inches and the height becomes 10.75, we have whole new ballgame (Assuming that reorienting "UP" does no harm). Now as seen in Figures 6 and Figure 7 (Variation B), the new best pattern has 32 cartons per course and 5 courses for a total of 160 cartons per pallet. This is a 3% improvement at no cost. More dramatic improvements are common but this is the procedure to find them.

Pallet Size Variations

If there are no external restrictions on pallet size (customers, shipping, etc.), it is possible for net space gains with a larger or smaller pallet platform There is no standard pallet so think broadly. We have shown a series of trials as seen in figures 8 through 13. The pallets are 48 x40, 48 x 48, and a really huge 60 x 54. The fact is that the larger the cartons are with respect to the pallet platform, the greater the advantage to be had by a larger pallet. Yes, a larger pallet takes more space (*See areas per load illustrations, where area per load is the 'footprint' of half the aisle plus the pallet, divided by the number of pallets stacked in the footprint*) but if the gain is enough,

the space per carton stored will decrease. In our example, there is an improvement going from 48" x 40" to 48" x 48". The huge pallet did not show an improvement but if the cartons were really large, the huge pallet may often prove advantageous. The comparison is seen in Figure 14, Space Efficiency Of Various Pallet Sizes. The Pallet from Figure 11 (48 x 40) is the best by almost 15.5%.

Conclusion

We like this software. Call or Fax us at the address below, A demo with one dimension fixed is available. If you want to buy it, It will cost \$500.00 for single user and \$900.00 for a network version. The cost is plus shipping and quantity discounts can apply.

The program accepts either metric or inch input.

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