OptiLedge® Implementation Handbook

The OptiLedge® Implementation Handbook

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An Introduction to the OptiLedge®

The OptiLedge was created by IKEA to improve the unitization of goods by providing a low cost, lightweight, unit load base. Extensive studies have proven that fully unitized goods reduce damage and significantly reduce the costs related both to labor during unloading and when palletizing shipments from import DCs into the general supply chain. The OptiLedge replaces other loading systems including floor loading, slip sheets and pallets.

Product Benefits

Environmentally Sustainable - The OptiLedge is made of strong, light and durable polypropylene which is easily recycled. The lightweight OptiLedge requires less fuel for transport thereby reducing the carbon footprint.

Lower Costs – OptiLedge users consistently save hundreds of dollars—mainly in fuel and labor costs—per container by unitizing goods on the OptiLedge. Significant savings result from dramatic reduction of labor required to handle imported goods and reduced fuel expenses due to the lighter weight of the OptiLedge. Other savings include reduced packaging costs and reduced damages.

Efficient Cube Utilization in Containers and in DCs - The OptiLedge, when not in use, nests together taking up dramatically less storage space than a traditional pallet. As an example, one truckload of OptiLedges would be the equivalent of 23 truckloads of traditional pallets. Goods unitized on the OptiLedge can reduce storage space requirements by up to 30%. The OptiLedge becomes a "custom-sized" unit load base as it fits your product and becomes integral to the unit load. The OptiLedge eliminates costly under-hang and increases container fill rates. Custom pallets are far too expensive for use with today's consumer goods and standard pallet sizes seldom "fit" your product and unit loads. This results in costly waste of space in containers and in DCs.

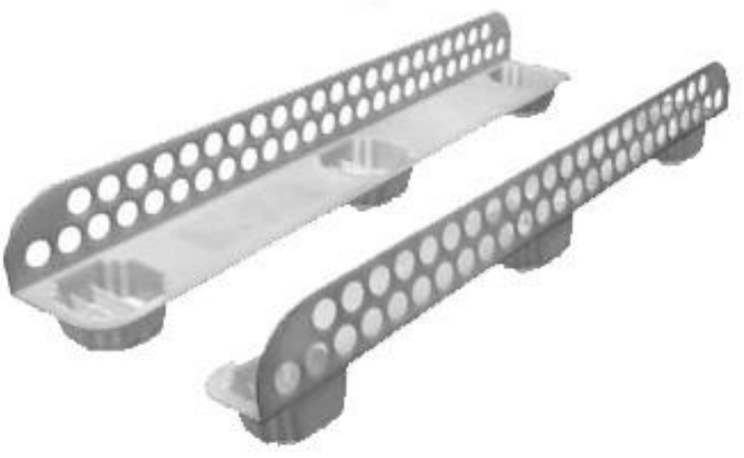
Lightweight -The OptiLedge weighs under two pounds compared with 50 to 75 pounds for a traditional pallet.

OptiLedge® Product Sheet: LP45 and HP85 Series

LP45 SERIES
LOW PROFILE

DESIGNED FOR:
Forklift Trucks Only

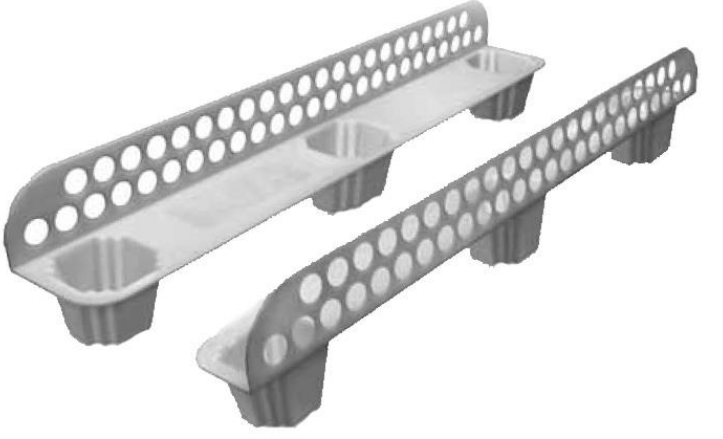
AVAILABLE LENGTHS:
760mm/30"
991mm/39"



HP85 SERIES
HIGH PROFILE

DESIGNED FOR:
Common Pallet Jacks*
Motorized Pallet Trucks*
& Forklift Trucks

AVAILABLE LENGTHS:
760mm/30"
991mm/39"*



www.optiledge.com

OptiLedge® Specifications

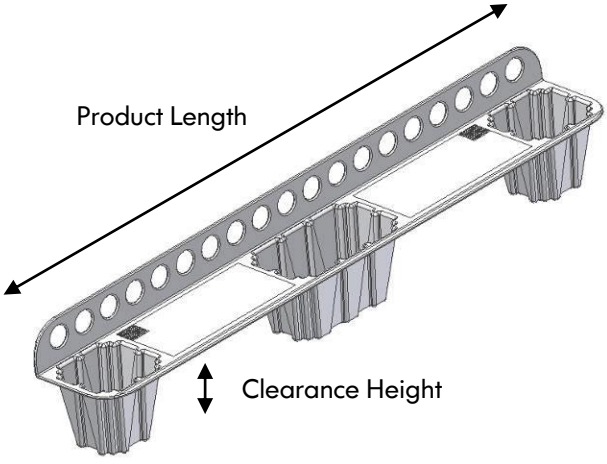
Injection Molded, High Impact
Co-Polymer Polypropylene

5
PP

	Short Sidewall	Tall Sidewall	Tall Sidewall
Weights	**Gxx-760**	**xx-760**	**xx-991**
LP45-xxx	365 g 0.81 lb	408 g 0.90 lb	495 g 1.09 lb
HP85-xxx	454 g 1.00 lb	463 g 1.02 lb	549 g 1.21 lb

	xx-760	**xx-991**
Lengths	760 mm 29.92 in	991 mm 39.02 in

	LP45-xx	**HP85-xx**
Heights	45 mm 1.77 in	85 mm 3.35 in



OptiLedge® Performance Range

Load Conditions	Pair of LP45-760s	Pair of LP45-991s	Pair of HP85-760s	Pair of HP85-991s
Warehouse (Floor) Stacking	3,846 kg 8,500 lb	3,846 kg 8,500 lb	3,167 kg 7,000 lb	3,167 kg 7,000 lb
Transport Mode	1,357 kg 3,000 lb	1,357 kg 3,000 lb	1,357 kg 3,000 lb	1,357 kg 3,000 lb

The OptiLedge is designed for excellent performance under load in a wide variety of environments. Evaluations conducted by independent ISTA and ISO certified laboratories coupled with field experience indicate that the OptiLedge performs well in warehouse (floor) stacking environments and in transport mode when the load limits do not exceed those shown in the table above. As products and use conditions vary widely, it is always best to conduct product specific trials to observe actual performance.

Solution Development and Implementation Process

Note that these steps do not necessarily represent individual, chronological stages. In many situations, multiple steps can be combined; and in some situations, steps can be skipped. These steps represent a full spectrum view to aid in implementing an OptiLedge solution.

1. Evaluation of the Product Candidate

Analyze the product components and how they are packaged. The goal is to reduce packaging components to take advantage of the OptiLedge as a unit load base. Consider handling and storage practices throughout the entire supply chain. Ideally, emphasis should be placed on using the OptiLedge as a unit load base that is handled with fork-lift trucks and pallet trucks thereby reducing damage caused by clamp trucks.

2. Development of Unitization Solution

Establish a viable solution based on available OptiLedge sizes and unit load size or quantity requirements. Be sure to take into consideration standard OptiLedge unit load recommendations as covered in this document, handling equipment requirements, and container yield impact throughout the distribution process.

3. Controlled Environment Trialing

Develop a test plan outlining the number of product samples required for each phase of static and/or dynamic testing including laboratory-based and/or field testing. This stage may consist of simple unit load warehouse stack testing, advanced laboratory performance tests or closed-loop handling tests in order to confirm proper solution design.

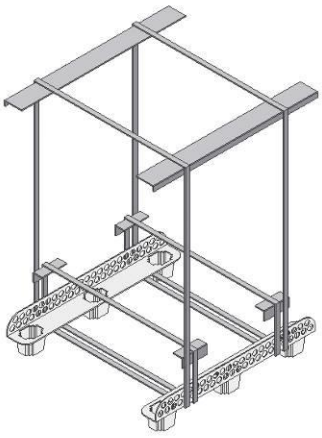
4. Distribution Ship Test

This phase, a macro-impact stage of testing, consists of larger scale field trials. By this stage, the unit load solution has been proven. This phase allows for a monitored opportunity to view how the unit load solution will actually flow through the various stages of the distribution environment and allows for a field-based introduction to the unitizing concept.

5. Full Scale Production Implementation

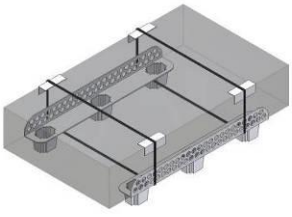
This phase may require final documentation and personnel training.

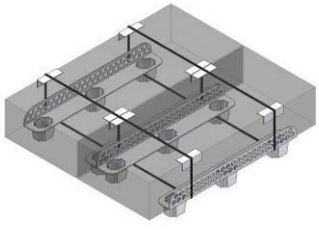
Guidelines for use of the OptiLedge® System

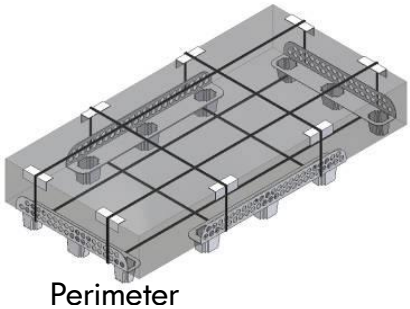


These guidelines represent recommendations for use in the development of unit loads utilizing the OptiLedge® System. Each supply chain is different. It is essential that every unit load concept be thoroughly tested under actual-use conditions to ensure that the appropriate unitization solution is chosen.

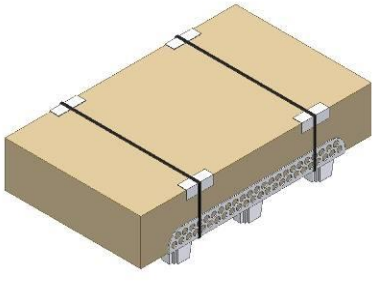
Basic Solutions - Base Layer Sub-assemblies





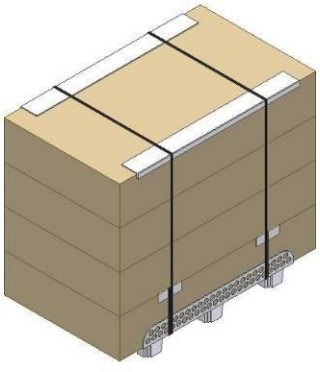


Standard Pair Tandem Perimeter



Step 1

Base Layer



Step 2

Full Unit Load

The OptiLedge® System consists of the OptiLedge (typically used in pairs) aligned and strapped to the bottom carton of a unit load; this creates the base layer: a self-contained, product-conformed shipping platform for which to stack more product. Appropriate corner board should be utilized when strapping the base layer carton to the OptiLedge and when strapping the full unit load pieces to the top of the unit load to allow for multi-unit-load stacking. (See strapping and corner board sub-sections in this document.) This will minimize slack in the strapping due to product/package compression. The sub-assembly step of using a base layer is recommended on all unit load solutions.

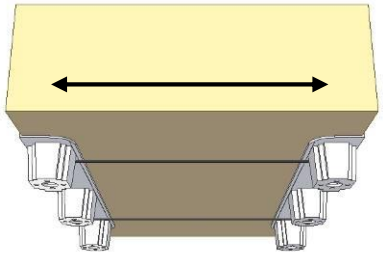
For some products, it may be beneficial to utilize a solid wooden (or other similar material) substrate sheet to provide additional unit load bearing distribution and center support on the underside of the unit loads.

Unit Load Design

Basic unit load design should always take into consideration product characteristics, packaging performance capabilities, handling and distribution environment requirements, and shipping container yields. Maximizing each of these constraints in balance with one another will result in a successful OptiLedge solution.

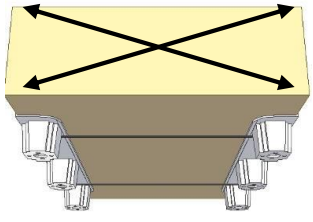
Basic Product/Package Requirements for Successful Unit Load Design

Rigid Spanning

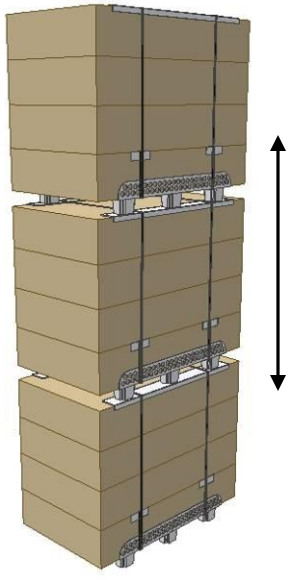


The product/package should be capable of supporting itself in a rigid fashion across spans between OptiLedge devices. It must also be able to withstand interaction with handling equipment across the bottom surface of the unit. If necessary, substrate materials can be used to strengthen the span and the bottom surface.

Non-Compressible



The combination of the packaging and the internal contents (product and dunnage) must be able to withstand strapping and stacking pressures without excessive damage or compression. The increased weight associated with stacking multiple unit loads may cause vertical compression that then loosens previously tight straps. It's imperative that the straps remain taut to securely hold the OptiLedge devices in place.

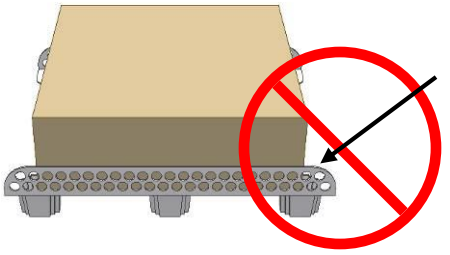


Air in the Box

Empty spaces or easily compressible materials such as Styrofoam or EPS result in *air in the box*. These voids greatly increase the likelihood of the packaging materials collapsing; therefore these scenarios are not good candidates for OptiLedge solutions. When considering the OptiLedge, excessive *air in the box* should be removed from the overall design or accommodated by materials such as wooden substrate sheets. Air is costly to transport and should be designed out of the packaging.

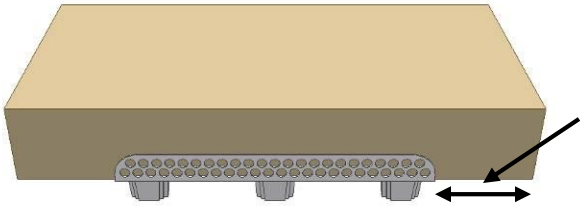
Unit Load Design

Under-Hang



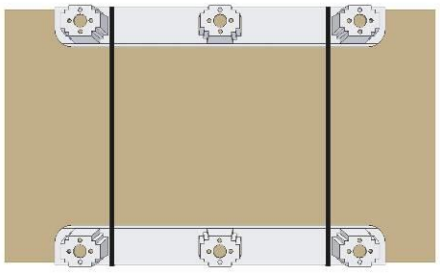
Product should not be allowed to under-hang the OptiLedge devices in any way.

Over-Hang



Over-hang is a critical issue when developing an OptiLedge solution and should be carefully considered and tested as necessary. Excessive over-hang, typically greater then 7.5" can cause product deflection at the ends of the unit load. A perimeter solution can often alleviate this. Note that carton corners provide a substantial portion of the unit load stacking strength, and long-term storage may impart forces on the unit load that short-term viewing doesn't always convey.

Geometrically Feasible

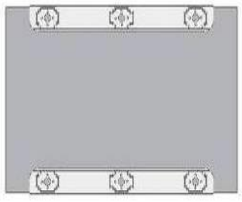


Although it is possible to design intermediary packaging components when configuring an OptiLedge solution for odd-shaped products, it is recommended that geometric friendliness be observed. For the OptiLedge device to work properly, it's critical that it be integral to the unit load by being securely attached to a solid 90° angle of a rigid item across its full length. Lack of support or freedom due to gaps or flexibility can damage the OptiLedge devices and the product.

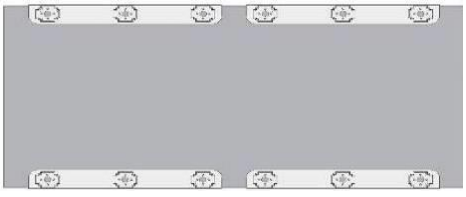
Unit Load Specifications

LENGTH Between	Use OptiLedge	Configuration
30"- 38"	HP85-760 (30")	Single Pair
39"- 53"	HP85-991 (39")	Single Pair
54"- 59"	HP85-1200 (47")*	Single Pair
60"- 80"	HP85-760 (30")	Double Pair
81"- 105"	HP85-991 (39")	Double Pair

SINGLE PAIR



DOUBLE PAIR (side-by-side)

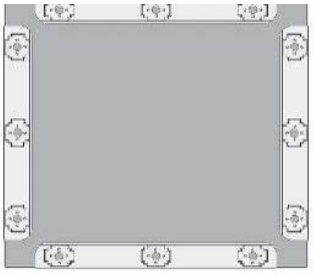


* Not available in all markets

Optional

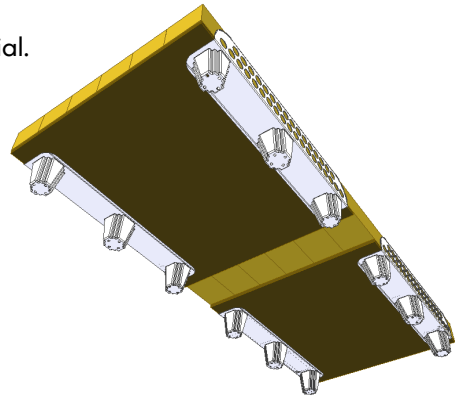
If **WIDTH** Greater than	Use OptiLedge
30"	HP-760 (30")
44"	HP-991 (39")

PERIMETER (on WIDTH side)



ITEMS REQUIRING BOTTOM PROTECTION – *Width greater than 47"*

- Board material can be OSB, plywood, fiberboard, or any rigid suitable material.
- Size is dependant on width of unit load

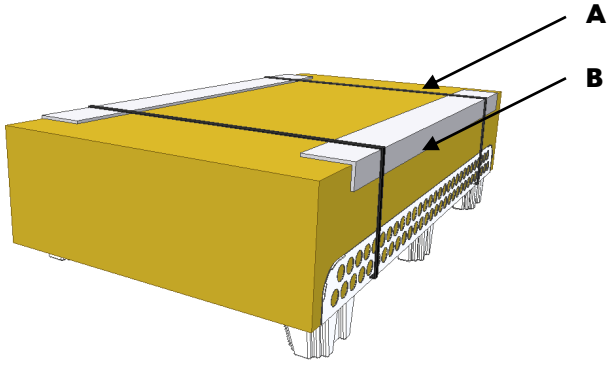


Anatomy of a Unit Load

A. Two to three ½" wide, 500-600 lb. break-strength polypropylene straps placed next to feet.

B. Two *L* x 2" x 4" x ¼"-thick corner board

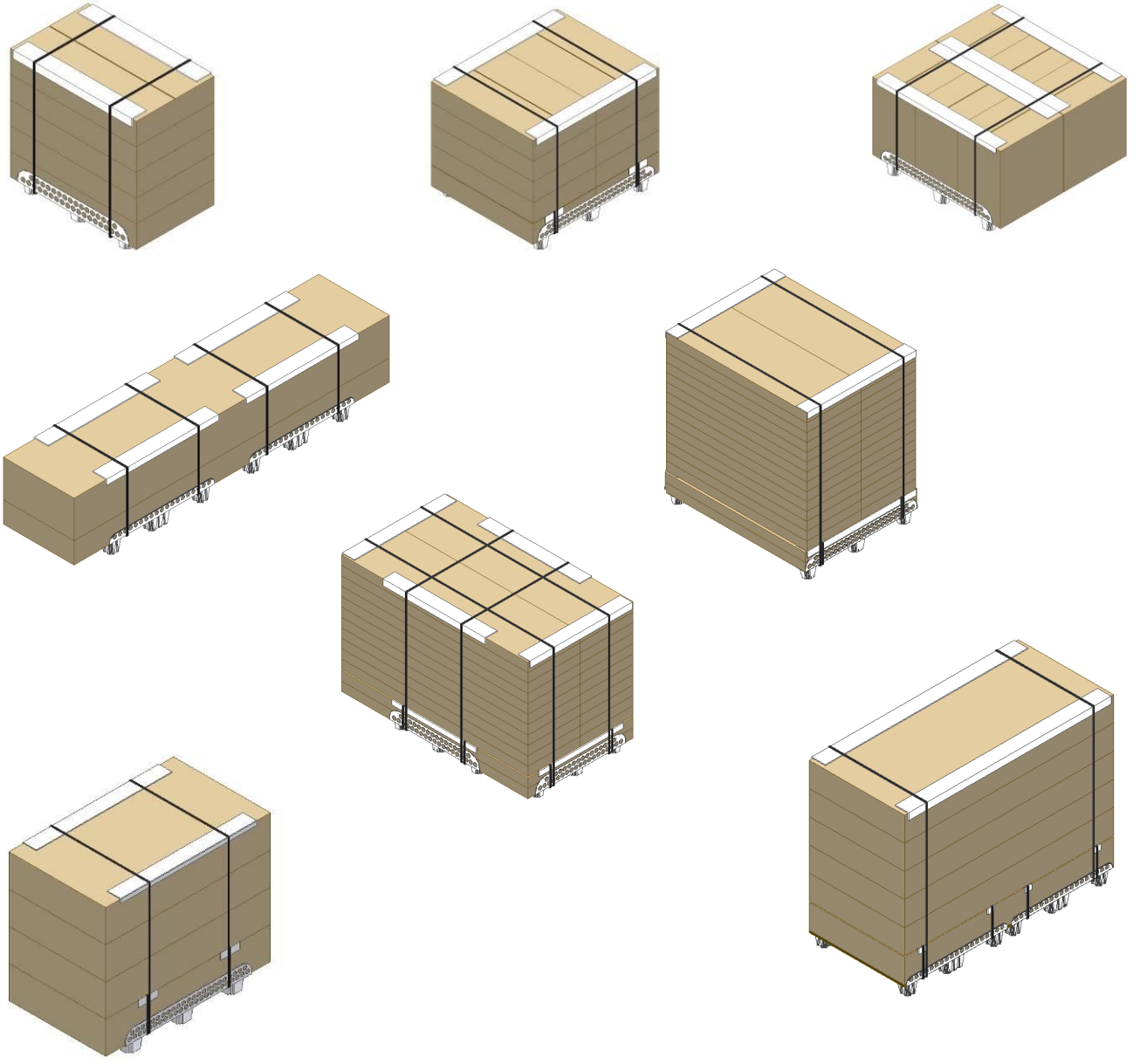
- *L* = 30" for xx-760
- *L* = 40" for xx-991
- *L* = 48" for xx-1200
- 3" x 3" corner board option for non-multiple boxes



Unit Load Design

Unit load solutions come in a wide variety of orientations and configurations based on the package size, the number of pieces per unit load, handling requirements, automated assembly techniques and the OptiLedge design used. The OptiLedge offers a method of unitizing that is adaptable to the product instead of adapting the product to conform to standard shipping platforms. It becomes a component of the packaging solution. Solutions are normally evaluated and tested to confirm proper synergy throughout the supply chain.

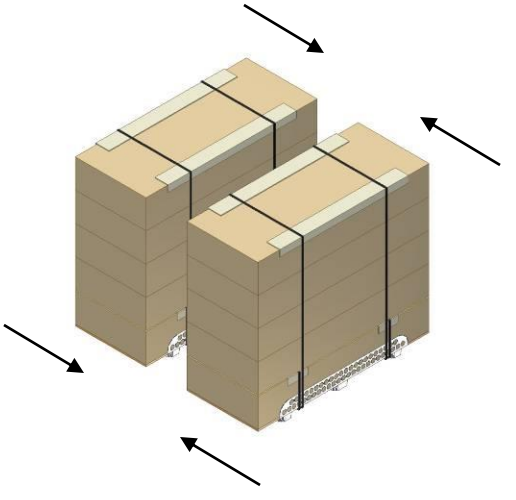
Examples of OptiLedge® Unit Load Solutions

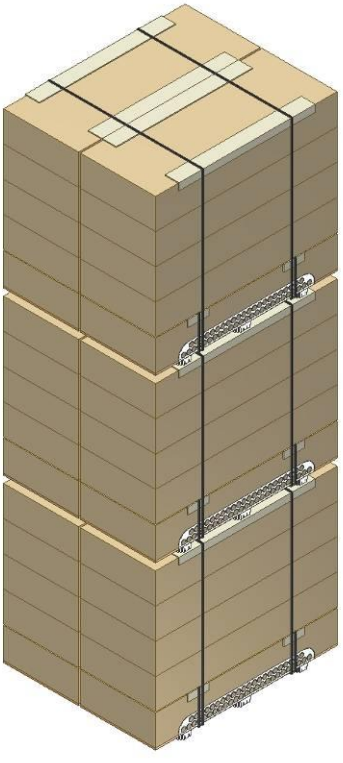


Unit Load Design - Tandem Unit Loads

In some cases, unit load solutions may result in tall narrow unit loads. When coupled with the need to stack multiple units high, the result can be unstable stacks and an unsafe work environment. It is recommended that all unit loads pass a 27° friction test to ensure stability.

One way to overcome narrow unit issues is to tie two unit loads together side-by-side, *aka* a Tandem Solution. When two unit loads are fully assembled, they can be strapped or stretch-wrapped tightly together into a single unit. This unit load now possesses a footprint twice as wide as the original, adding stability to both the stacking and handling processes. Tandem unit loads are easy to break down into multiple units without disassembling the unitization packaging.



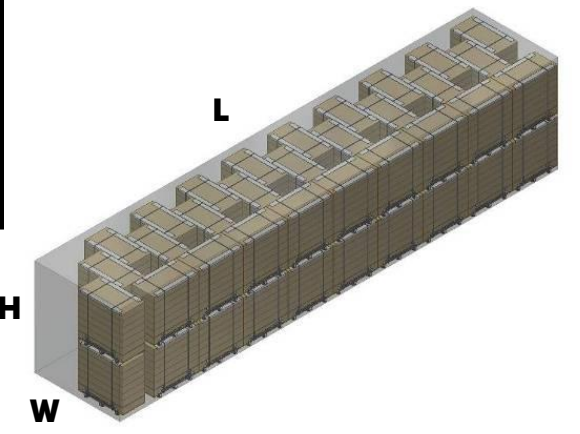


Shipping Container Data

Trailer/Container Dimensions

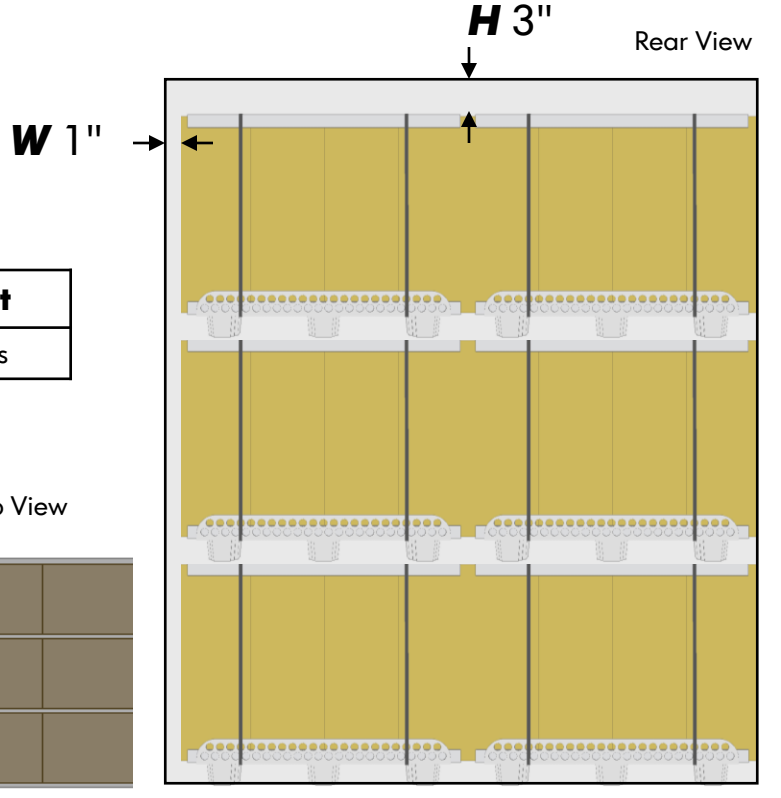
Below are the standard inside dimensions used for analysis of trailer and container units.

Type	L (in)	W (in)	H (in)	W (lbs)
53' Trailer	630	98	110	45,000
40' OC	474	92	93	42,000
40' HC OC	474	92	105	42,000
20' OC	233	92	93	35,000



Space Allowances for Container

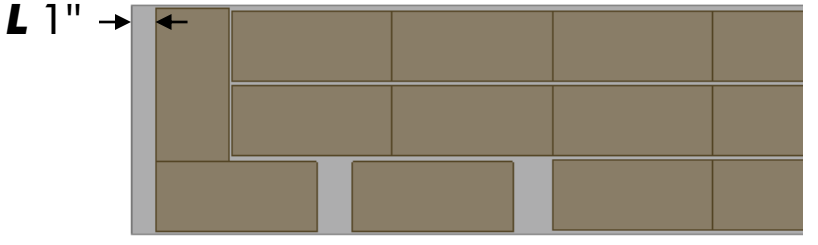
For material handling equipment to move product in and out of the container, enough space must be allowed between unit loads and the inner walls. Below is the recommended space allowances also used for calculating cube efficiency.



Length	Width	Height
1 inch	1 inch	3 inches

Rear

Top View

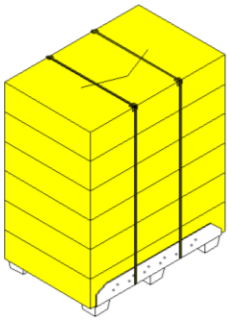


TOPS®Pro software

TOPS®Pro software has been found be a useful tool to assist customers in developing optimal package design and unit load parameters. It can also be used to calculate packaging size, configuration, stacking strength, and truck configuration. TOPS®Pro uses a powerful real-time 3D graphics engine to produce visual images to analyze loading patterns.

TOPS®Pro software includes the OptiLedge as an alternative shipping platform.

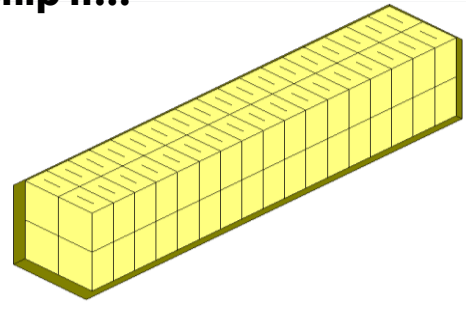
Load the OptiLedge



By selecting one of OptiLedge options within the software, we can generate multiple unit load patterns to optimize the cube.

We can also create mixed loads for more efficient shipments and for retail store display.

Ship it…



Using this proven software, we then develop container and trailer loading solutions.

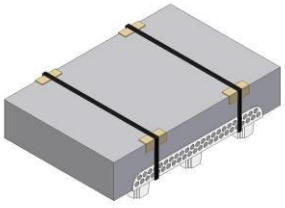
Analyze it…

HP 85-2 LEDGE 42.00x27.25x3.35

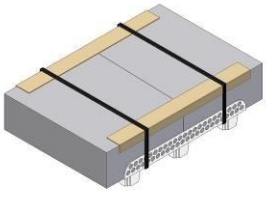
	Shipper (ID)	Shipper (OD)	UnitLoad (Incl. Pal)	Vehicle Load
Ln:	41.375 in	42.000 in	42.00 in	462.00 in
Wd:	26.375 in	27.000 in	27.25 in	84.0 in
Ht:	7.688 in	8.000 in	51.35 in	102.7 in
Net:		0.000 lb	0.000 lb	0 lb
Grs:		55.000 lb	333.000 lb	22644 lb
Cube:	4.8548 ft3	5.2500 ft3	34.0081 ft3	2306.31 ft3
		Height Vert		
Shipper:			6	408
UnitLoads:				68
Area Efficiency:		0.00 %	99.08 %	88.41 %
Cubic Efficiency:		0.00 %	90.33 %	86.47 %
Cases per layer:			1	204
UL per layer:				34
Layers/load:			6	2
Pattern:			Column	Interlock

Corner Board Recommendations

Depending on the configuration, corner board may be required. Corner board or corner protectors should always be used when applying strapping as it allows the strap to slip around the package as tension is applied. This ensures even tensioning around all sides of the package.

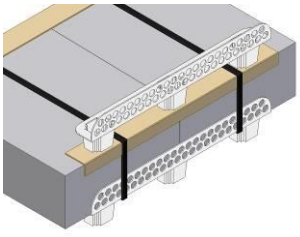


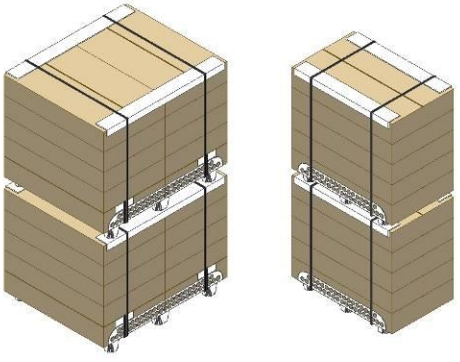
Base layer strapping is recommended to minimize strap lengths and ensure a stable base when picking individual products from the unit load. When strapping base layers, corner board or corner protectors should always be used. Long pieces are recommended for multiple cartons as this helps tie them together and creates a more stable base.



It may be necessary to place corner board directly onto the OptiLedge before placing the first carton. This technique is useful when the placement of narrower cartons result in carton ends between OptiLedge feet or when the weight or point loading of subsequent layers requires load-bearing distribution.

A final application of corner board on the top layer of packages is beneficial in providing a stacking surface for load-bearing distribution for multi-unit load stacking. Full-length, heavy-duty corner board is usually recommended for this application.



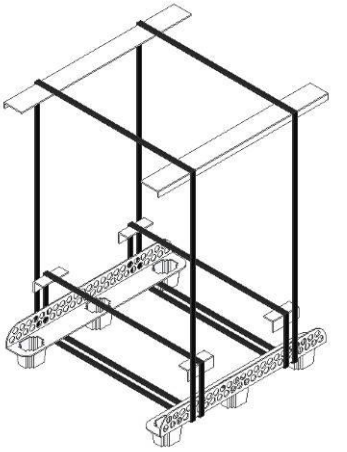


Recommended Corner Board Material

Short-Length, Light-Weight Non-Stackable Unit Corner Board
Material: 0.180" +/- 0.050" thick
5 x 5 x 15 cm (2" x 2" x 6") minimum

Full-Length, Heavy-Duty Stackable Unit Corner Board
Material: 0.220" +/- 0.050" thick
10 x 5 cm (4" x 2") x (OptiLedge length plus 7 cm [3“] minimum)

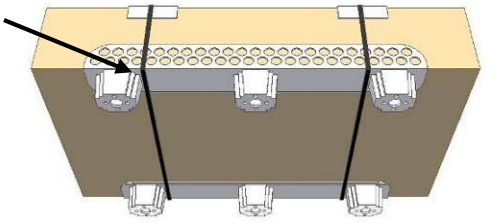
Strapping Recommendations



Strapping is the primary way to attach the OptiLedge to products and packages. Because of the importance of securely and tightly attaching the OptiLedge, proper strapping is essential. Polypropylene strapping is recommended because of its physical properties. Polypropylene will stretch and recover (referred to as “elasticity”), providing a more secure attachment of the OptiLedge to the product.

Base-layer strapping is always recommended to minimize strap lengths. Should unit loads of product compress when stacked, (a likely occurrence under heavy weights) base-layer strapping minimizes the amount of slack that could occur within the straps thereby assuring the OptiLedges remain in place. It also ensures a safe base for order picking once the unit load strap is cut. Base-layer sub-assembly is one of the most important keys to building successful unit loads.

Note that when applying strapping, a minimum of two straps per OptiLedge pair should be used and they should always be positioned as close to the outer feet as possible. In some cases, a third strap, placed on either side of the center foot, may be necessary as well.



Recommended Strap Material

Polypropylene Strap (PP) "Poly-strap"
Material: 13 x 0.6 mm (½" x 0.022")
135-205 kg (300-450lb) ABS
(typical recommendation)

Polyester Strap (PET) "Nylon"
Potentially usable, though not usually recommended unless there is zero compression in the packaging and no air.

Steel Strap, Not Recommended

Strapping Application Equipment

Manual Strapping Equipment

There are a number of ways to apply strapping and the method is typically determined by volume requirements and labor cost/availability. Numerous automated strapping solutions are commercially available for large volume production. In lower volume situations, the following options may result in more economical solutions.

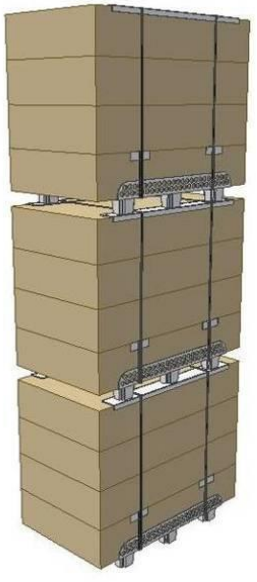
Two piece Hand-held Tensioner and Hand-Crimper
Requires metal crimp-clips for strap sealing
Price range: $100-$300 USD per set, numerous manufacturers

Battery operated all-in-one hand-held tensioner and sealers.
Uses friction generated heat for strap sealing, no clips required.
Price range: $1,000-$3,000 USD, numerous manufacturers

Handling Equipment, Stacking and Racking

The OptiLedge is designed to allow the use of fork style handling equipment while minimizing the overall impact made by the devices themselves on the distribution environment; i.e. weight, material, etc. The high profile (HP) OptiLedge is designed for use with most fork lift truck and pallet jack handling equipment. The low profile (LP) OptiLedge is designed for use with fork lift trucks and low profile pallet jacks.

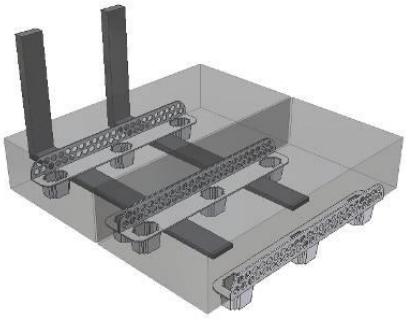
The OptiLedge can be used in racking systems with the addition of wire mesh or wood decking or custom designed rack support systems. Many customers maintain open rack systems and use wooden slave pallets.



Customers can take advantage of how the OptiLedge "fits their product" to create efficient floor stack storage. The load-bearing capacity of the OptiLedge permits high multiple unit load storage.

Handling Equipment, Stacking and Racking

The learning curve associated with proper handling of OptiLedge unitized products is very short. However, habits developed during years of handling wooden pallets—such as spinning the unit load or bulldozing units across the floor—can damage the OptiLedge. While the OptiLedge does not require gentle care, proper handling practices should be employed to provide maximum benefit. This also results in damage reduction and greater economic benefits.



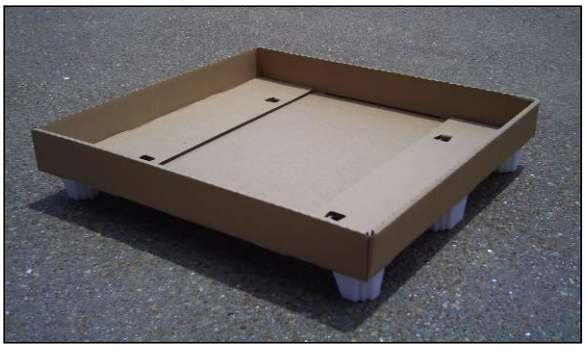
OptiTray® - An OptiLedge Corrugated Tray Sub-assembly

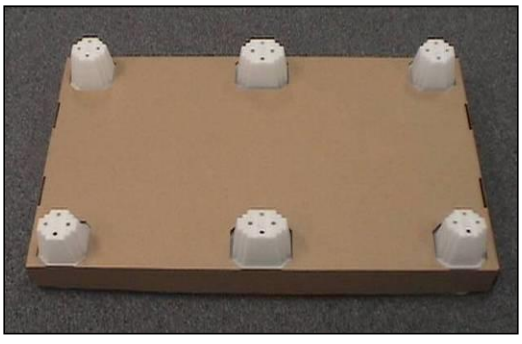
The OptiTray corrugated tray sub-assembly provides an alternative means for utilizing the OptiLedge, widening the scope of potential applications as well as assembly and attachment techniques.

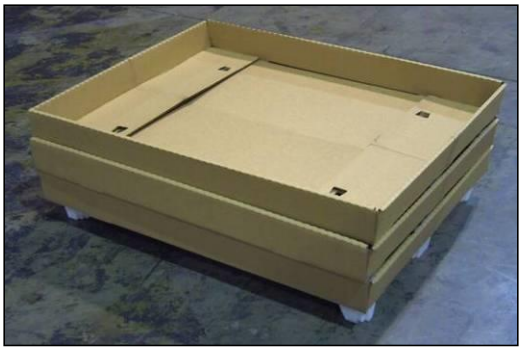
The OptiTray® is…

- A single-wall, simple fold-up, die-cut corrugated tray with print capability
- When assembled, a self-contained customizable shipping platform
- Extremely lightweight, efficient, recyclable and sustainable
- Ergonomically friendly, clean and nesting capable
- A simple self-assembly fixture for properly positioning the OptiLedge devices within
- A quick and secure means for attaching the OptiLedge devices to a product by means of various ways …

Encapsulation	Adhesives
Strapping	Stretch wrapping

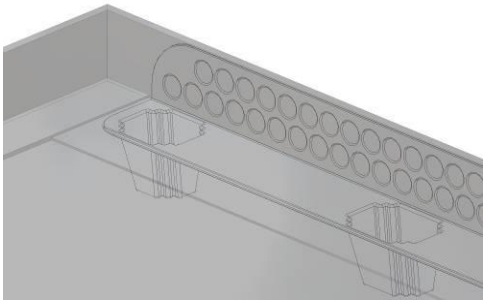


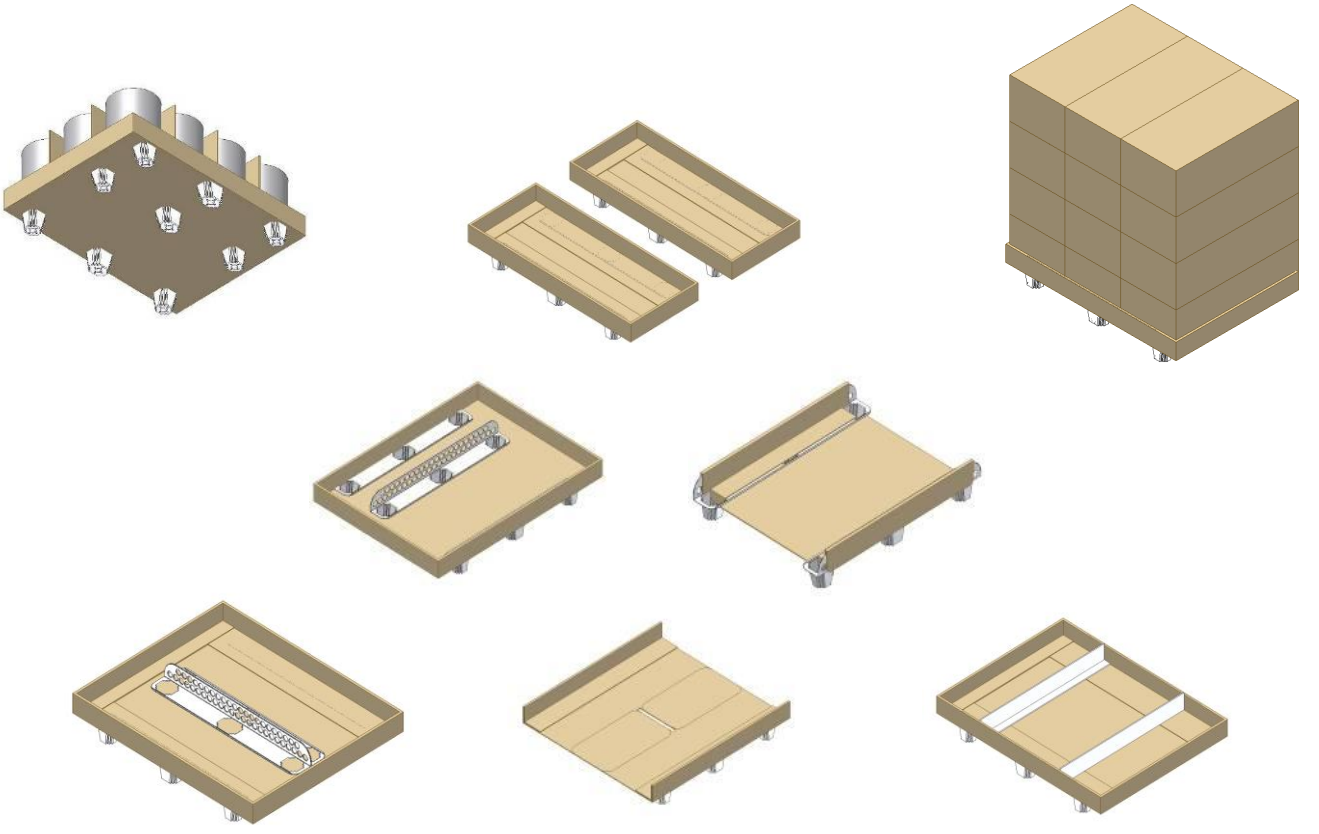




OptiTray® Solutions

One important characteristic of the OptiTray is that the tray depth is equal to or greater than the height of the OptiLedge device sidewall. This, along with flaps folding over the OptiLedge horizontal surface, creates the geometry that encapsulates the OptiLedge devices and provides the basic strength of the design. This also allows for quick and proper placement of the devices as well as a secure means to hold them in place throughout distribution. Using these simple guidelines, the tray designer is able to customize the tray into a wide variety of shapes and sizes and to focus on load-bearing and handling requirements.





Once the basic design and performance traits of the system are understood, designs can be customized in a near limitless assortment of ways, optimizing the solution for the specific application. Using various internally positioned substrate materials, additional corrugated assemblies, and/or internally assembled corner board, the standard OptiTray can be customized for additional benefits.

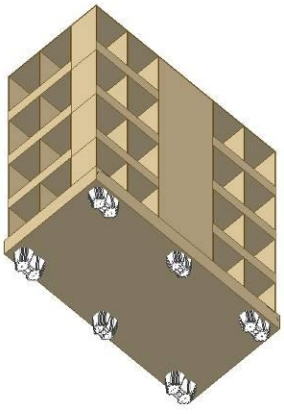
Point of Purchase Displays

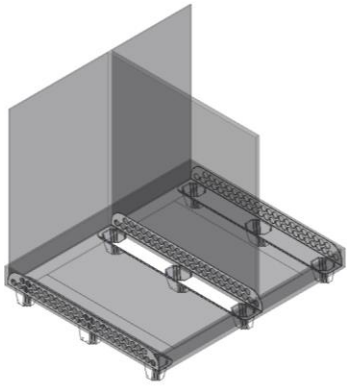
POP displays are an entire market segment directly suited for the OptiTray. Such displays frequently utilize a bottom tray or can easily be adapted to do so. As always, proper attention to load distribution during the design process is required.

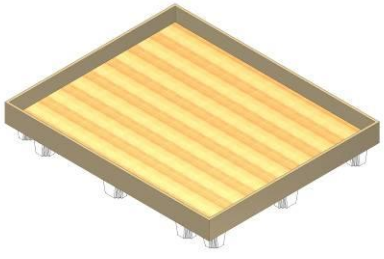
Column load bearing within the display needs to vertically align with OptiLedge support. Consequently, it is critical that use of the OptiLedge be considered during the initial design of the display as opposed to attempting a retrofit.

In some cases involving larger displays, centrally located OptiLedges or wooden substrates may be required to bridge load-bearing gaps or to insure flat level surfaces in the bottom shelf cavities.

When designing the display, be sure to consider load-bearing support for the display when the OptiLedge feet are resting on the floor as well as during handling when fork-tine engagement occurs between the OptiLedge feet.

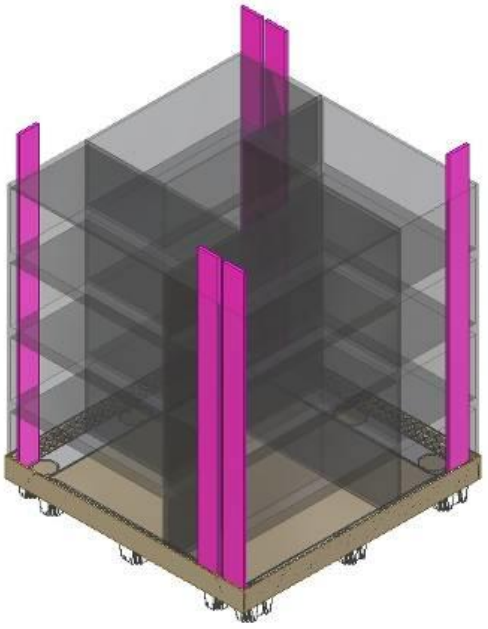


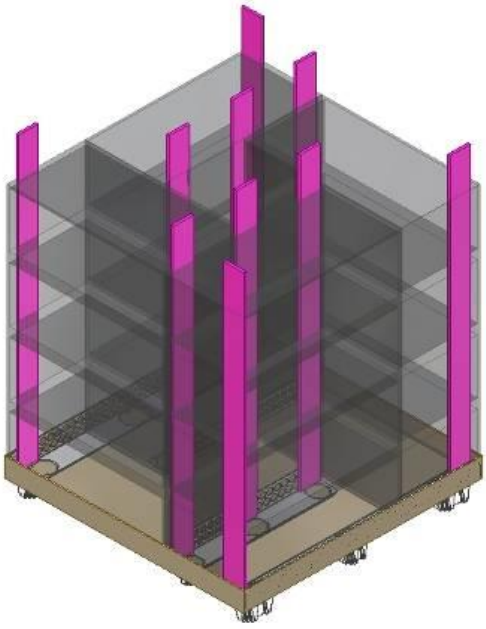


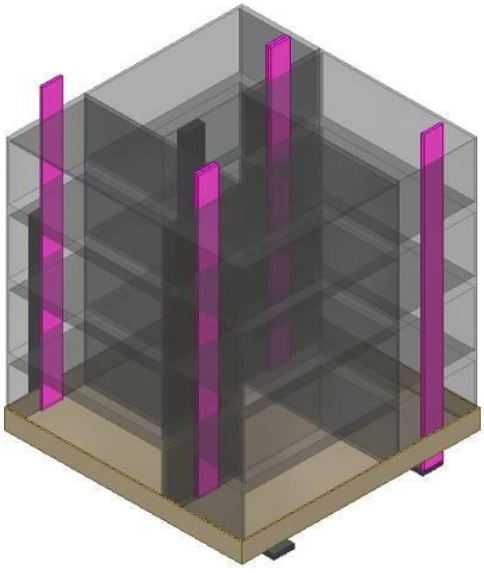


Point of Purchase Displays – Load Bearing

Consider load-bearing distribution both during static display, when the product weight is distributed down through the OptiLedge feet, and during dynamic movement, when the product weight is distributed down between the OptiLedge feet to the handling equipment fork tines.

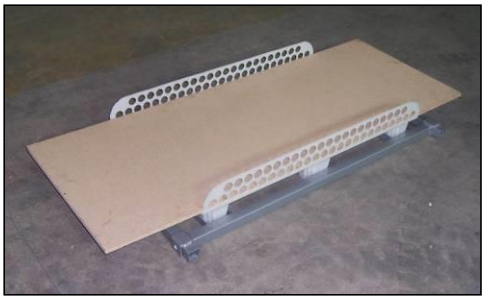


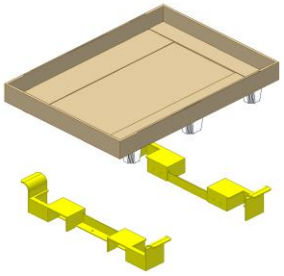


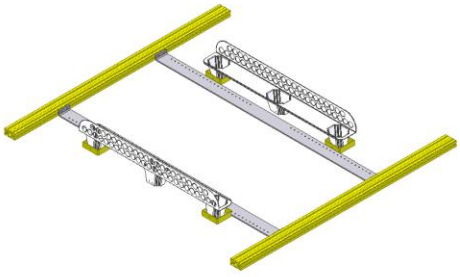


Assembly Fixtures

Assembly fixtures can be used to make the proper alignment and placement of the OptiLedge a quick and measurement-free process. They can also be used to hold the devices in place during product placement if necessary, or as a form of conveyor-based slave pallet, allowing for use of the OptiLedge without mechanical line modifications. Adjustable fixtures, pallet jack friendly fixtures, even corrugated tray assembly fixtures can be quickly fabricated from wood, metal, or even off-the-shelf components.



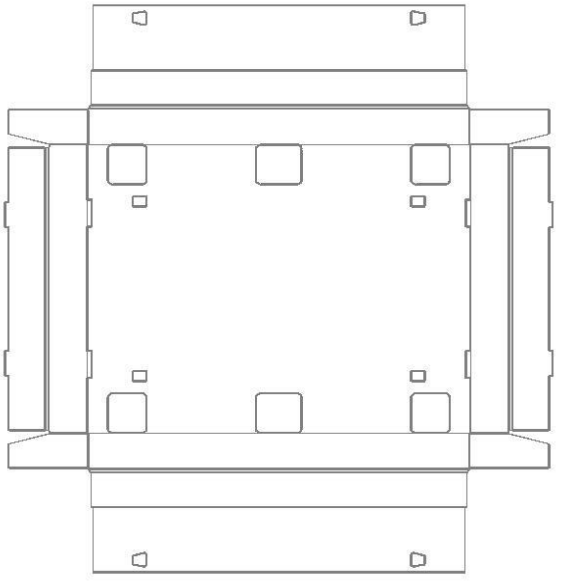




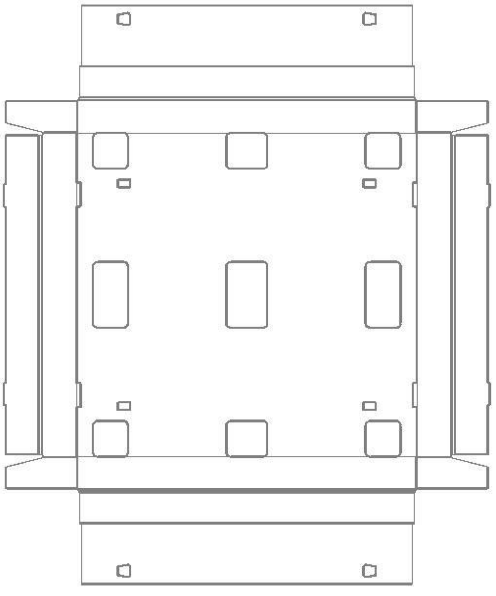
Automated Application

Automated application of the OptiLedge devices is accomplished through a variety of proven and established methods including robotics. If you require assistance due to the complexity of automated application, please contact your OptiLedge representative directly.

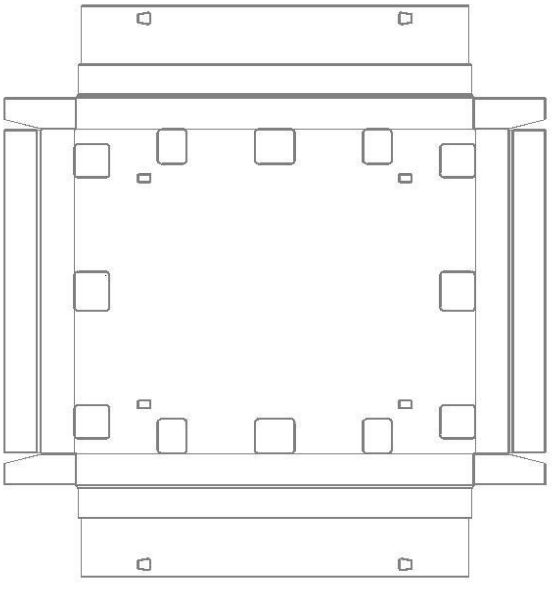
OptiTray® - Appendix



Standard Single Pair Solution

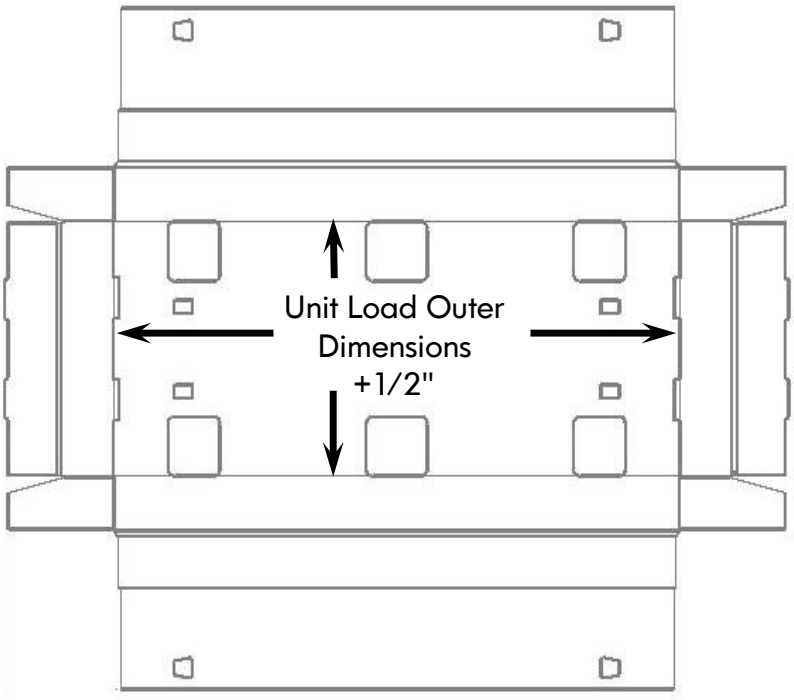


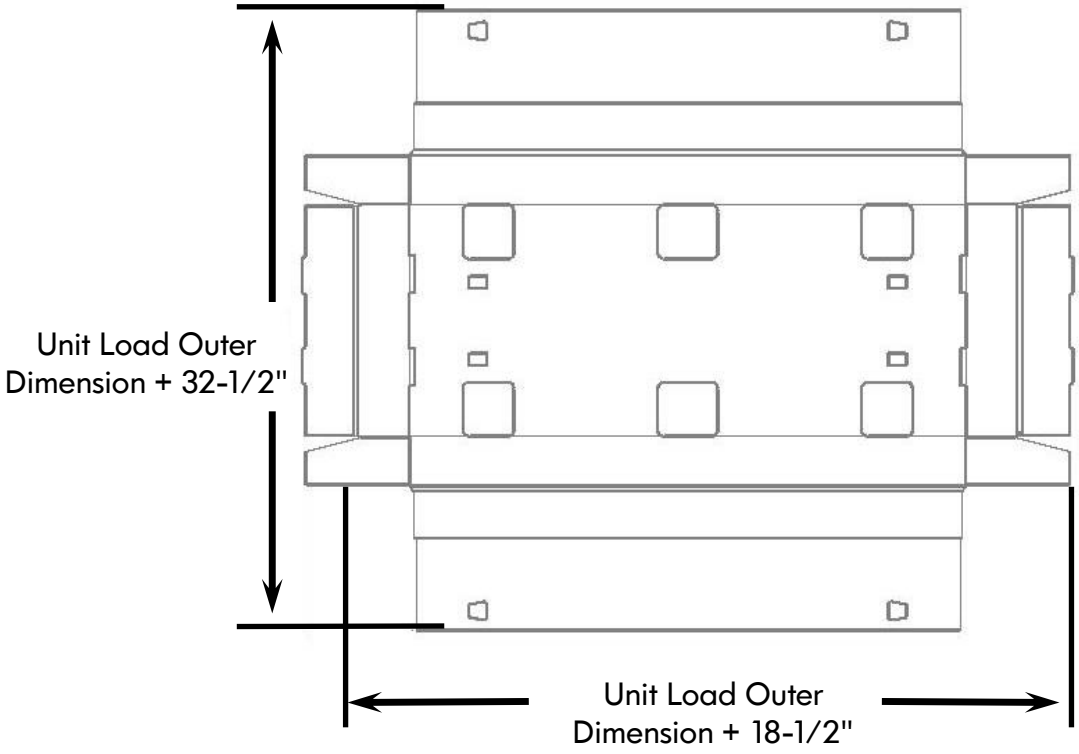
Standard Tandem Pair Solution



Standard Perimeter Solution

OptiTray® - Appendix





OptiTray® - Appendix

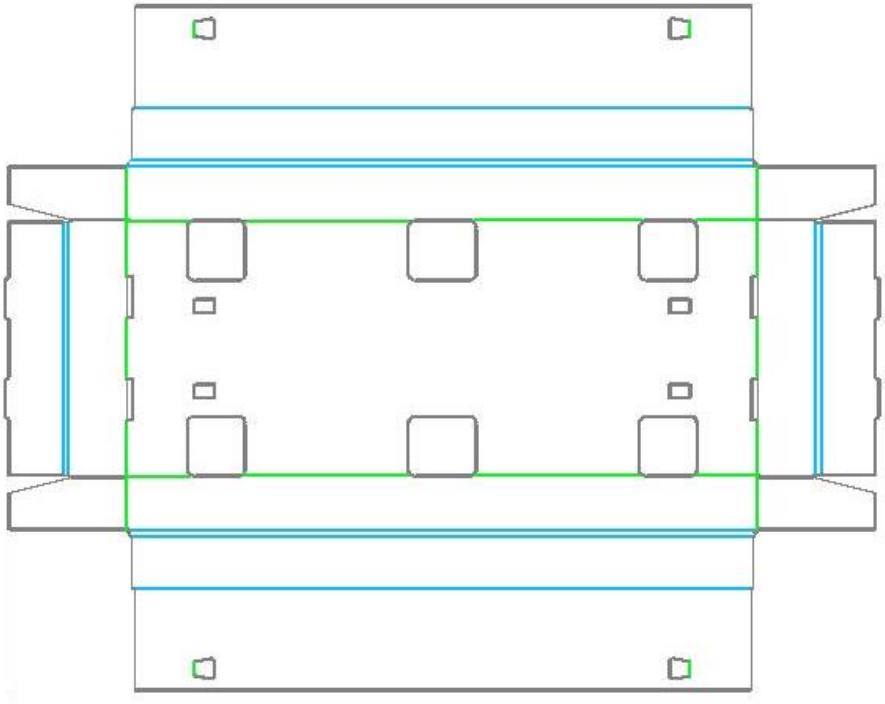
Standard OptiLedge Tray Layout

Line-Type Legend for Standard Tray Design

Black – Cut

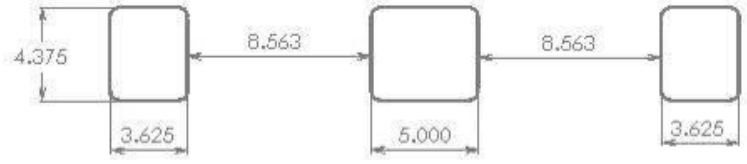
Green – Score

Blue – Perf-Score

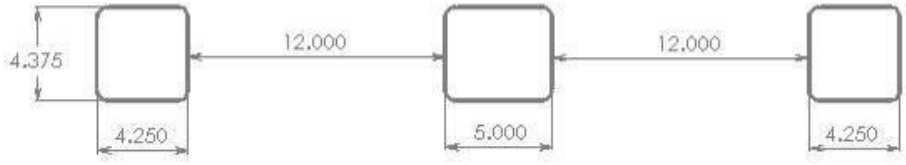


Single Pair Design Shown

Foot Cut-out Dimensioning



Cutouts for 760 Series Devices

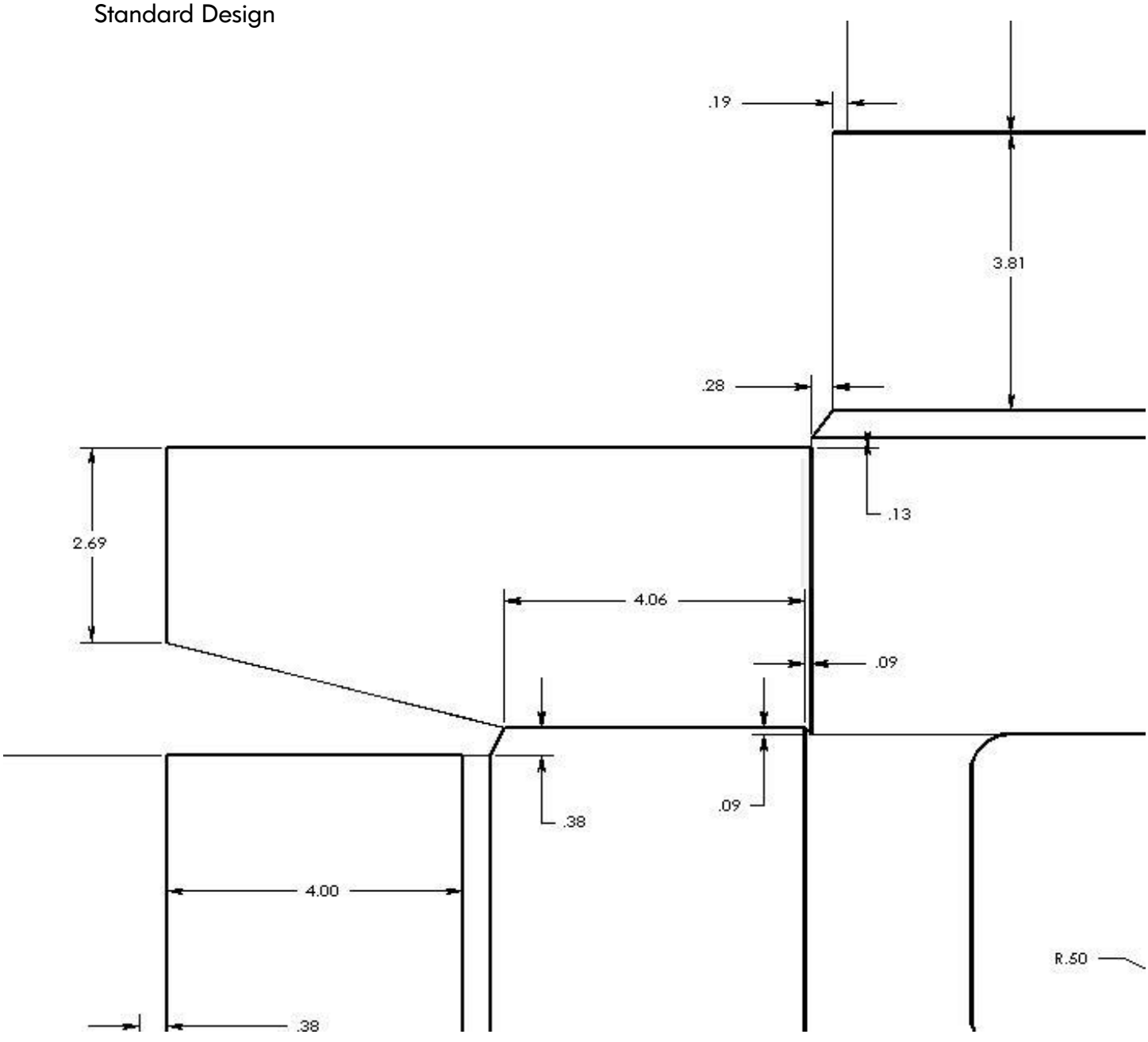


Cutouts for 991 Series Devices

OptiTray® - Appendix

Single Pair 991mm OptiLedge Tray Dimensions (1 of 3)

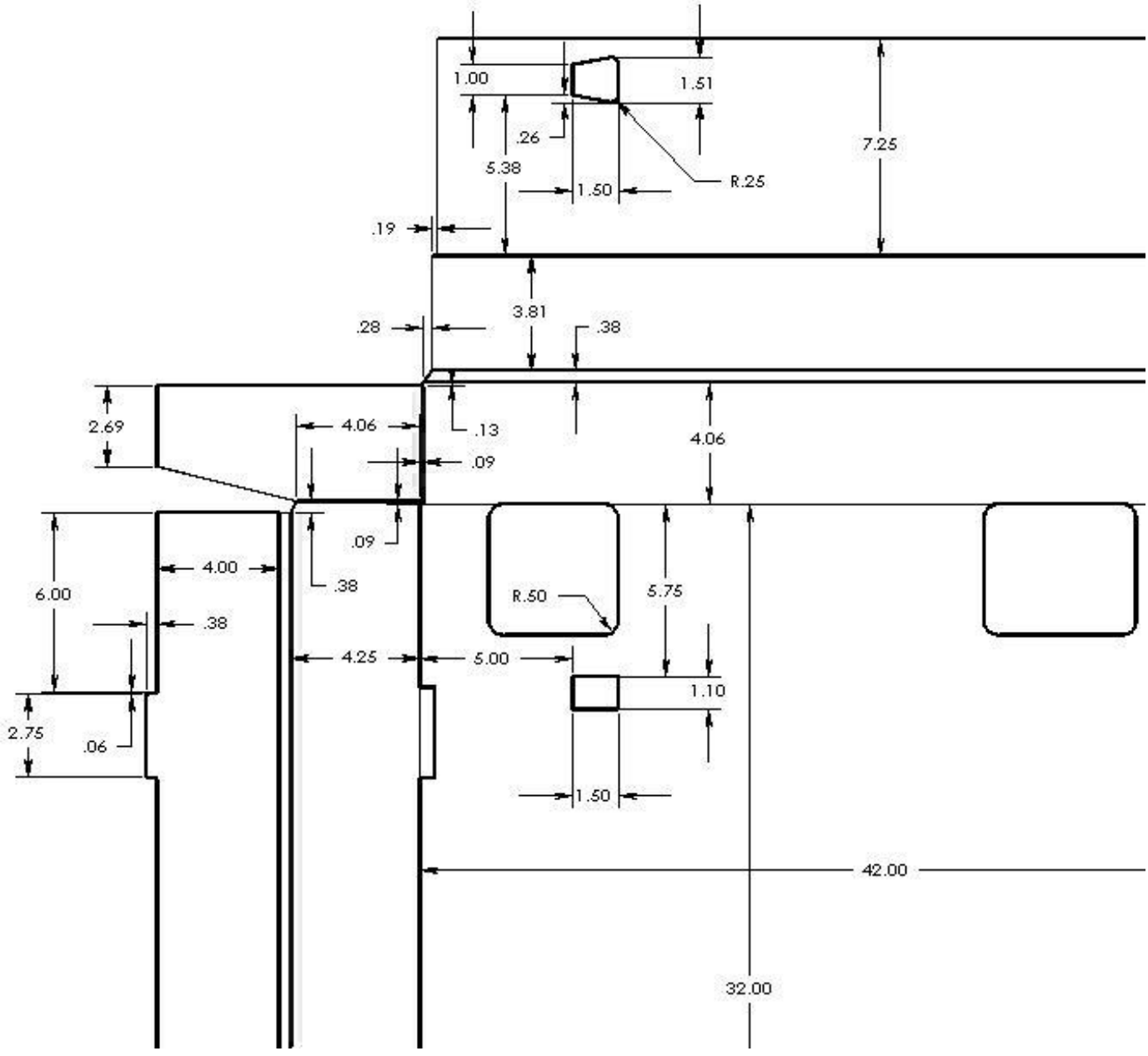
Standard Design



OptiTray® - Appendix

Single Pair 991mm OptiLedge Tray Dimensions (2 of 3)

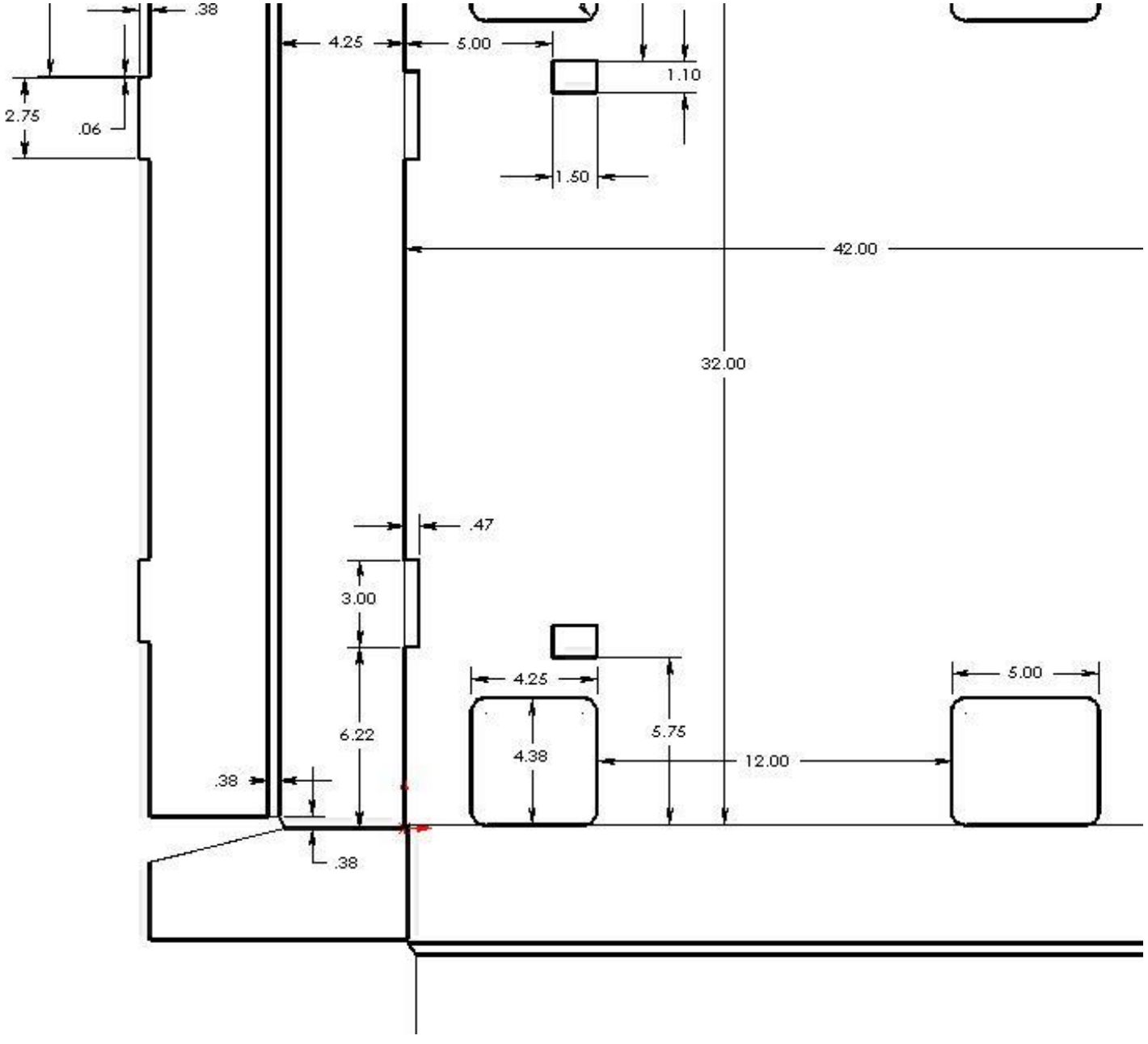
Standard Design



OptiTray® - Appendix

Single Pair 991mm OptiLedge Tray Dimensions (3 of 3)

Standard Design



Support / Resources

OptiLedge® Website www.optiledge.com