CPI CABLE PATHWAY SOLUTIONS

WHITE PAPER

Shaping Up Pathways with Shaped Cable Tray

How Flattened Steel Wires Helped Reduce Cable Strain and Increase Surface Area by 400%

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The Challenge: Decrease Strain and Increase Surface Area for Cabling Media

Whether IT infrastructure is deployed across an enterprise class data center or a small network closet, each design still shares one common element—the need for reliable and optimized data communication. In cable pathway applications, that reliability is realized through a tray that ensures cabling media is allowed to operate at the speed and bandwidth in which it was designed.

Following the principal that a flat surface offers more support and surface area than a round surface, OnTrac® Shaped Tray creates an indoor cable pathway application that increases cable support across basic point-to-point and high-density backbone connections. The simple change of using flattened cross wires (instead of the round cross wires found in traditional basket tray) resulted in a new design that not only creates more support, it also remained easily configurable, environmentally friendly and UL Classified. Independent testing confirmed that OnTrac Shaped Tray's flattened cross wires offered 400% more surface area than a sample tray with round cross wires, and reduced strain on cables by as much as 63% percent.

Fit, Form and Function: Cable Pathway's Ultimate Purpose

Wire mesh cable tray systems have met cable pathway needs for years with an excellent load bearing capability that can be deployed underneath raised floors, suspended from ceilings or mounted on the tops of racks and cabinets. Most commonly designed with round steel cross wires that have been welded into a rectangular basket, traditional wire mesh trays are responsible for protecting and supporting sensitive copper and optical fiber cabling as it travels across data centers, network equipment rooms, office spaces and commercial buildings.

In general, the best practice in network cabling applications is to ensure that pathways do not strain copper cable through sharp bends, twists or crimping that can change physical properties of the cable (i.e. twist rates and the relative positions of cable pairs).[1] Ignoring this practice can result in a network that has to resend data, slower networks or the loss of a network connection. This risk is compounded in high speed networks like data center networks where some connections are the critical connections between computer processors and computer data storage. Fiber cable, which has a glass core, has similar physical properties and concerns. Crimped fiber and sharp bends can result in unseen damage that causes the light signal to be lost.

Hoping to reduce this risk with an update to traditional wire basket trays, Chatsworth Products, Inc. (CPI) is offering OnTrac Shaped Tray as an alternative design that challenges the IT industry to reshape its thinking.

CPI's OnTrac Wire Mesh Cable Tray System includes Standard (top) and Shaped Tray (bottom). Note that the U-shaped cross wires are visibly larger on the OnTrac Shaped Tray.

Product Overview: OnTrac® Shaped Tray

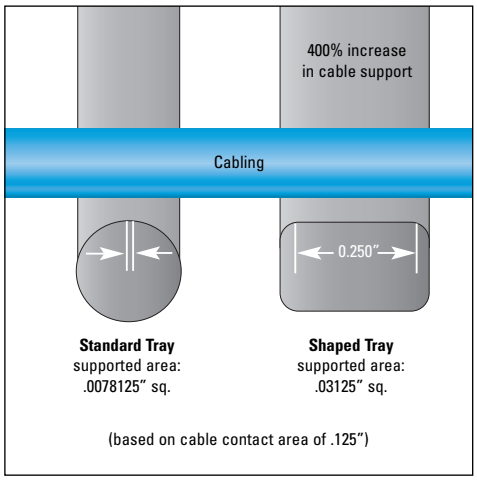
At first glance, OnTrac Shaped Tray looks quite similar to the OnTrac Standard Tray System, which is also offered by CPI. Both are made from steel wire that has been welded into a 2" x 4" (50 mm x 100 mm) rectangular grid pattern, are easily cut for smooth transitions and turns, and have been UL Classified (select sizes and finishes) for suitability as an equipment grounding conductor. However, a closer look at the new OnTrac Shaped Tray reveals one very significant difference in the cross wires.

While traditional tray systems use a round cross wire to support cables, OnTrac Shaped Tray features unique flattened cross wires that have been designed to increase contact surface and support. This need for an increased contact surface is especially important in high density applications, where even a moderately sized tray can hold in excess of 500 individual Cat 6A UTP cables[2], leaving cables installed at the bottom of the tray to support the weight of several hundred sitting on top.

OnTrac Shaped Tray is available in multiple sizes and finishes, including a black and glacier white powder coat finish (UL Classified in US & Canada) and pre-galvanized (UL Classified in US).

Key features for OnTrac Shaped Tray include:

- Easy-to-use pathway solution that supports large quantities of network cables
- Can be cut and configured to create smooth curved transitions around obstacles
- Open top design makes cable moves, adds and changes easier
- Available in multiple widths and depths to match cable fill requirements
- Easy to splice and bond together
- Support trays from the floor, ceiling, wall or the tops of racks and cabinets
- Select sizes/finishes are UL Classified as an equipment ground conductor
- Constructed from 5 mm and 6 mm diameter steel wires, welded on 2" x 4" (50 mm x 100 mm) intersections
- Available in three heights of 2" (50 mm), 4" (100 mm) and 6" (150 mm) and various widths in standard 10'L (3 m) sections
- Wide range of splices, clamps and supports available



CPI's shaped wire offers a flat plane to support the cabling media, which greatly reduces any pressure or strain on the conductors.

Green Initiatives: Recycled and Cleaned

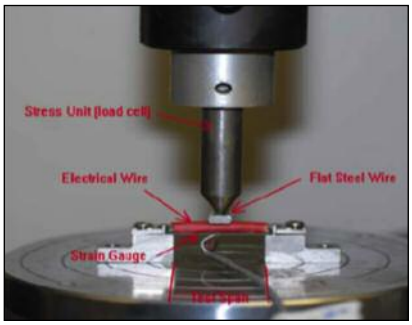
OnTrac Shaped Tray not only supports cabling, but sustainability as well. Each section of tray is manufactured from 100% recycled steel and available in a pre-galvanized finish that avoids post manufacturing chemicals used to plate the tray. The pre-galvanized finish is also mechanically cleaned after the welding process to remove any soot or oils from the manufacturing process.

Other green initiatives include:

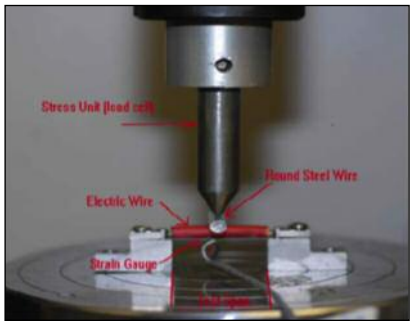
- No post production chemical plating with pre-galvanized finish (a huge environmental impact)
- Packaging and strapping are recyclable

Independent Testing: Flattened Cross Wires vs. Round Cross Wires

OnTrac Shaped Tray was submitted to St. Louis Testing Laboratories[3] for an independent study that could compare the strain a cable endures on a flattened wire versus a round wire. Using an Instron Model 1011 Universal Testing Machine, the stress unit imposed loads on a flat cross wire and a round wire that were positioned against a red data cable. Both strain and force measurements were accomplished using an Instrunet Data Acquisition System, Omega strain gauges and thin-beam load cells.



Flat Setup



Round Setup

Strain measurements were taken as force was applied, with the maximum load reaching 0.3168 lbs. During the round wire test it was determined that a pressure sensor small enough to fit within the contact area between the round wire and data cable was not immediately available. This meant pressure values had to be calculated using the applied force and calculated surface contact area. The contact surface areas were calculated using an assumed "flat" of 0.125" for the data cable and an assumed "flat" of 0.0625" for the round steel tray wire.

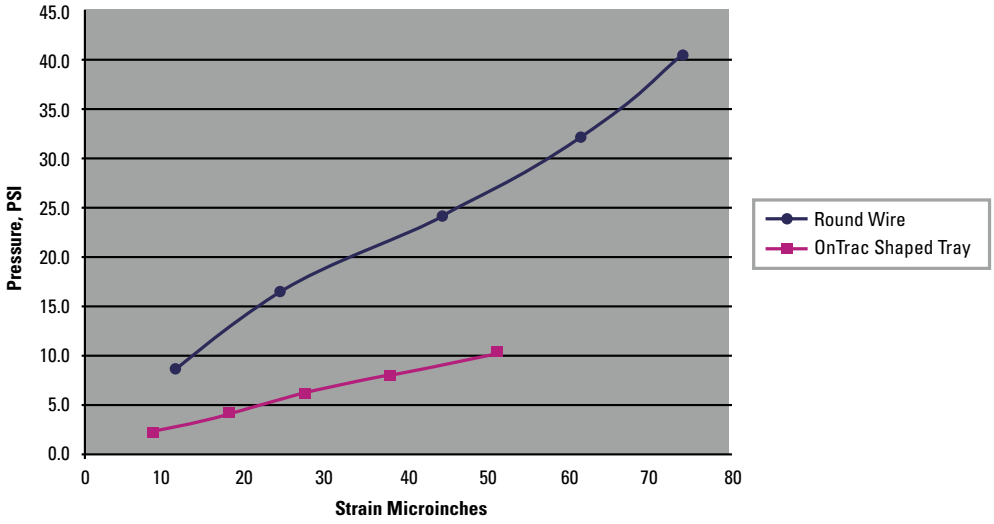
Surface Contact Area Calculations

	Width of Flat	Data Cable Flatness	Surface Contact Area
Flat Wire	.025 in.	0.125 in.	0.03125 sq. in.
Round Wire	0.0625 in.	0.125 in.	0.0078125 sq. in.

Calculated conservatively, the surface area of a standard round cross wire is .0078125. By comparison, the flattened cross wire on OnTrac Shaped Tray is .03125, a four times larger surface area.

Comparison testing between round and flat cross wires revealed that the resulting applied local pressure on each data cable was considerably lower on the flat (shaped) cross wires. As loads were incrementally increased against the data cable, the calculated applied local pressure on the round cross wire was approximately four times higher than the pressure on the flat wire.

The use of micro strain gauges (placed just beyond the width/diameter of each cross wire example) during the load tests also showed a consistently increased amount of bending strain on round cross wires over flattened ones.



With testing loads ranging from a minimum of .0676 lbs to a maximum of 0.3168 lbs, the strain placed upon cables on the flat (shaped) cross wires remained consistently lower when compared to equal loads placed against round cross wires.

Contact Area Square Inch	Flat Load lbs	Wire Pressure PSI	Bending Strain Inch	Contact Area Square Inch	Round Load lbs	Wire Pressure PSI	Bending Strain Microinches	Decrease in Strain Flat Versus Round
0.03125	0.0676	2.2	8	0.00781	0.0676	8.7	11	**37.5%**
0.03125	0.1291	4.1	18	0.00781	0.1291	16.5	24	**33.3%**
0.03125	0.1876	6.0	27	0.00781	0.1876	24.0	44	**63.0%**
0.03125	0.2507	8.0	38	0.00781	02507	32.1	61	**60.5%**
0.03125	0.3168	10.1	51	0.00781	0.3168	40.6	74	**45.1%**

Conclusions: Increased Support and Decreased Strain

As expected, the presence of OnTrac Shaped Tray's flattened wires produced more surface area and support than round cross wires. Further illuminated through testing and side-by-side comparisons, the flattened cross wire design of CPI's OnTrac Shaped Tray was proven to supply cables with up to 400% more surface support area than standard round cross wires. In turn, this added support promotes a reduction in cable strain by as much as 63%, ensuring that the conductors within each cable are optimized to perform as intended within any high-density networking application.

References and Acknowledgements

[1] "Standard for Installing Commercial Telecommunications Building Cabling," NECA/BICSI 568-2006, Section 4.2.1, Page 24, 2006.

[2] "Estimated Cable Fill Capacities for CPI Cable Management and Pathway Products," Chatsworth Products, Page 15, 2012

[3] "Load Pressure Deflection Testing to Compare Flat and Round Cable Tray Wire," St. Louis Testing Laboratory, Karl Schmitz, 2009.