LAPP GROUP NORTH AMERICA

DESIGN TIPS FOR CABLE CARRIERS





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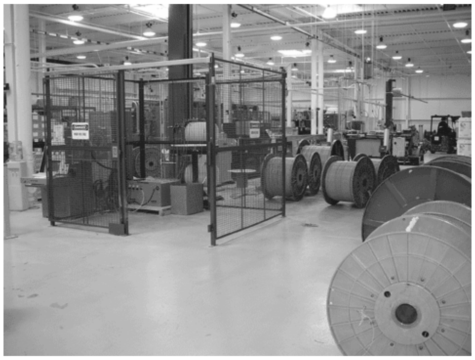

The Lapp Group North America headquarters located in Florham Park, New Jersey houses Lapp USA, Lapp Cable Works and our latest expansion, Lapp Group's Center for Competence and Innovation. This Center is assessed by UL as a Client Test Data Program (CTPD) laboratory for Product Testing, R&D, Quality Validation and New Product Innovation. Lapp Cable Works is our state of the art cable manufacturing plant for ÖLFLEX® brand quality products and custom designed cables. In addition, this facility houses Lapp Systems, which provides complex harnesses, integrated solutions and custom cables assemblies.

2600 PEOPLE, 21 LANGUAGES 1 WORLDWIDE FAMILY

In the late 1950's, Oskar Lapp turned his visionary dream into reality with the invention of the first industrially manufactured control cable, ÖLFLEX®. This marked the beginning of our story. Today, the Lapp Group produces innovative cables, connectors, accessories, and engineered solutions as a worldwide market leader. Oskar Lapp's vision continues today through his wife, Ursula Ida, and his sons, Andreas and Siegbert Lapp.

Within 50 years, the Lapp Group has grown to 2,600 employees operating around the globe developing, manufacturing and selling more than 40,000 products. With 17 manufacturing sites, 39 company-owned sales operations, more than 100 foreign representations and worldwide headquarters in Stuttgart, Germany, the Lapp Group people are everywhere you need us to be.

TRACK STARS
DESIGN TIPS FOR CABLE CARRIERS

Compared to other components, cable carriers might seem relatively easy to specify. Still, where the lifelines of a system are involved—power cables, communication lines and hose — a pragmatic approach helps prevent catastrophes.

Correctly specifying cables is important because they can fail if flexing-cycle and bend-rid limits are exceeded. However, cable carrier design is just as important. Carriers shield and protect cables from fatigue and crimping brought on by exceeding precisely defined geometry limits, so they must be dimensioned like any other motion component. You might say that improperly populated cable carriers “derail” entire production lines. That’s why (once interconnection needs are established and movement requirements solidified) cable and track selection is the first important step toward continuous motion efficiency.

Along with picking the right carrier material, proper cable and hose management is achieved by aligning track components with proper segregation techniques. There are plastic (nylon) and metal (zinc-plated steel) tracks offered; dividers also come in plastic and metal. Plastic is the most commonly used material because it is less expensive and quieter. Metal is used in harsher environments (particularly in metal-cutting applications) where weld splash, solvents, coolants, and abrasives exists. It comes down to checking specific setup geometries: interconnection trains can be kept on track with assembly techniques and documentation to control departure, transit, and destination paths.

TRACK STARS
DESIGN TIPS FOR CABLE CARRIERS

Plastic tracks are most common because they are less expensive and quieter.
Only the harshest environments contaminated with weld splash, solvents, and abrasives require steel.

Formulas indicate designs with the most functional integrity and determine the appropriate cable carrier size; clearance safety factors are the first considerations.

Cables: Add 10% to the outside diameter. This value id cØ+sf.

Pneumatic lines: Add 15% to the outside diameter. This value is pnØ+sf.

Hydraulic hoses: Add 20% to the outside diameter. This value is hydØ+sf.

The next step is to determine inner cavity height. The largest of all cØ+sf, pnØ+sf, and hydØ+sf values should be determinated and then used to determine minimum cavity height.
Finally, inner cavity width is calculated by summing all cable and line diameters and safety factors.

$$\Sigma all\Phi = \Sigma c\Phi + sf + \Sigma pn\Phi + sf + \Sigma hyd\Phi + sf$$

Maximum cavity fill should be approximately 60% of the maximum space available for proper cable/track management—in other words, less than 60% of the cavity area. Similarly, the largest cable or hose diameter an a properly applied safety factor determine proper carrier bend radius. Generally a leeway of about 10% or so should be allowed for inherent "crown" or pretension.

Carrier length

Where should a cable carrier en and begin, and where should it be mounted?
Determining these locations help prevent pulling stretching, and even disconnection of lines. The fixed point at center of travel should be

$L_K = L_S / 2 + L_B$
Where total travel= L_S
Carrier length= L_K
And Loop length = L_B

Calculated
$L_B = (3.14 \cdot BR) + 2 \cdot t$
And where t = link pitch
The fixed point is calculated
$L_S + L_B + L_K$

A pragmatic approach is substantiated by selection criteria for all material , designs, interfaces for the entire system, and simulation of the targeted solution.

Let the bug guy through

Proper carrier bend radius is determined by the largest cable or hose diameter. A 10% leeway should be allowed to prevent problems from inherent pretension.
This fixed point at end of travel is also important to verify, because it allows for the most efficient determination of carrier length.

Fixed point off center of travel is

$L_K = L_S /\ 2 + L_B + Off_{CMT}$

Where the total number of links is

$\Sigma t = LK / t$

After using these formulas for reference, all necessary geometric parameters should be determined to fully define the application. This stage is often when cable track manufacturers want to get involved.

Customized directions

For easier design evaluations, most manufacturers like to get involved as soon as dimensions are determined. Their concept drawings reveal the best options and push the design along. To properly match materials, after meeting system design criteria, internal programs simulate all parameters entailed in a specific populated track application. A software representation of the simulation is generated, along with the quotation and concept drawings.

Perhaps the most important facet of solution-searching is a customized procedural manual. While basic control documents (such as basic population and subassembly drawings) are helpful, procedural manuals take this a step further. General system setup notes, detailed, ubassembly drawings, and specific assembly steps can include illustrated digital pictures of key assembly techniques. Procedural manual are revision-controlled and provided as a proprietary control document for review and control of the entire system solution. This total approach allows for an accurate and repeatable process for assembling populated tracks.

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