



How Advanced Electrical Wire Harness Solutions Can Help Protect the Integrity of Your Heavy Duty Vehicle



Heavy Duty Vehicles Must Perform in Some of the Most Variable and Complex Environments Imaginable

This poses challenges to the machinery itself and the electrical design engineers who create it. These engineers have the great responsibility of producing rugged, robust, and resilient equipment that can stand up to the world's most extreme conditions. Simultaneously, they face challenges like global competition, compressed development cycles, fuel economy, and regulatory standards.

There's no doubt that OEM design engineers are always looking to perfect the features and functions needed for their heavy duty vehicle designs to perform when and where they are needed most. Facing the dust, dirt, debris, grease, and water that come with the territory, not to mention constant vibration, variable temperature changes, and possible chemical disturbances, proper vehicle design is critical to successful transportation and heavy duty vehicle applications.

To enable the anticipated levels of GDP growth globally, the McKinsey Global Institute estimates that the world will need to spend roughly \$57 trillion on infrastructure by 2030¹. Meanwhile, McKinsey & Company research shows that global investment in energy, infrastructure, mining, and real-estate-related projects, which was about \$6 trillion in 2013, could reach \$13 trillion by 2030². To complete these projects and meet demand, durable and reliable heavy duty vehicles will be vital.

THE WORLD WILL NEED TO SPEND ROUGHLY
\$57 TRILLION
ON INFRASTRUCTURE BY 2030

¹Nicklas Garemo, Stefan Matzinger, and Robert Palter. "Megaprojects: The good, the bad, and the better." McKinsey & Company. <https://tinyurl.com/y8qr9wgt>.

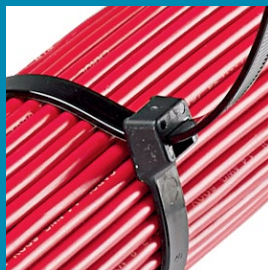
²Sriram Changali, Azam Mohammad, and Mark van Nieuwland. "The construction productivity imperative." McKinsey & Company. <https://tinyurl.com/yax7nwfq>.

For electrical design engineers at transportation OEMs to capitalize on this global need, they must be as close to the cutting edge of wire harness technology as possible. To become a leader in heavy duty vehicle manufacturing, OEMs must firmly understand the unique design challenges they face and how selecting advanced solutions can help overcome those challenges. OEMs should look for products that ensure increased performance and functionality, decreased cost, and support flexible tooling options, and partners that provide the technical support needed to help address everyday concerns and create custom solutions. A reliable technical partner like Panduit can help OEMs succeed and capitalize on the increasing demand for heavy duty vehicles.



Expert Solutions that Create Dependability, Durability, and Flexibility

For heavy duty vehicle designs to perform in strenuous environments, they must have the durability and ability to withstand every element that could possibly destroy them - vibration, salt, environmental issues, the sun, abrasion, and the list goes on. They must be built to last, and withstand the constant abuse of their lifecycle, with even the smallest components making the largest difference in achieving a dependable and flexible machine. While durable and dependable wire harnesses are certainly important to heavy duty vehicles, the fasteners holding them in place must be equally reliable. Recognizing the importance of flexible designs, Panduit creates the parts and tools necessary for robust wire harnesses and heavy duty cable management. **(Note for electronic readers: Click the image for more product information)**



Heavy Duty Cable Ties

- Exceed industry standards for use in high vibration areas
- Withstand internal and external temperatures
- Made in a wide range of materials, styles, and sizes
- Promote design flexibility
- Utilize added tensile strength
- Provide increased bundle diameter variations
- Improve reliability and productivity



Double Clamp Cable Ties

- Built for durability, dependability, and to be cost-effective
- Secure and separate parallel hoses, tubing, wires, and wiring bundles
- Feature an easy to install one-piece design
- Utilize a strong loop tensile strength to give secure support for high load applications
- Custom created for an OEM customer, now offered as a public Panduit offering



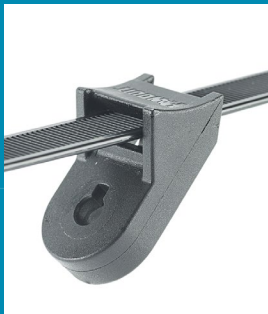
Double Loop and Triple Loop Cables

- Easy to install
- Perfect for underhood hose and harness routing
- Offer multiple loop capability
- Leverage a strap body to evenly distribute clamping forces
- Prevent bundle damage
- Provide high tensile strength
- Securely routes bundles
- Offered in double loop and triple loop styles



Wide Strap Cable Ties

- Easy to install
- Secure hoses, tubing, wires, and wiring bundles
- Feature a wide, thin body
- Offer more flexibility
- Utilize a strong loop tensile strength to provide secure support
- Minimize pinching on hoses and tubing
- Prevent heat and UV weather damage and is impact modified because of its Nylon 6/6 material



Heavy Duty Cable Tie Mounts

- Reduce the part number inventory
- Cover multiple bundle sizes
- Can utilize threaded fasteners already present in the vehicle
- Easy to use
- Maintain a standoff from the frame
- Avoid bundle abrasion
- Efficiently apply with a variety of other cable ties
- Offer multiple position configurations
- Allow flexibility in their application
- Can be installed faster than metal clamps
- Built with Nylon 6/6 material to withstand tough application environments



Rotating Mounts

- Can join bundles of cable, tubing, or hoses need to move or are not parallel
- Separate bundles to avoid abrasion
- Built with Nylon 6/6 material to withstand tough application environments





Innovative Technology That Provides Consistent Performance and Reduction in Costs

As a global innovator of cutting edge wire harness technology, Panduit plays an important role in the design and production of heavy duty vehicles. These solutions are developed with a focus on dependability and flexibility and lead to a reduction in costs.

When it comes to the lifecycle of a heavy duty vehicle, repairs are inevitable with routine maintenance a necessity which could lead to replacing parts. Panduit's high-performance wire harness solutions are designed with productivity in mind and allow for quick assembly, meaning less time is required for expected and routine maintenance, as well as any unexpected breakdowns. Panduit solutions are easy to install and reduce complexity, allowing users to deliver consistency and decrease installation time and labor cost.

To be effective, vehicles must be operational. A breakdown in wire harness solutions can cause enough downtime to set projects up for failure.

Even routine maintenance of heavy duty vehicles presents challenges. That's why specifying reliable parts and products from the beginning is paramount to achieving productivity and profitability. Wire harnesses are found in hard-to-reach locations, making frequent repairs much more time consuming. To be effective, vehicles must be operational. A breakdown in wire harness solutions can cause enough downtime to set projects up for failure.

To avoid this, every Panduit solution is tested for guaranteed interoperability and constantly evaluated for increased performance — from durability to strength to weather and temperature resistance. To achieve higher reliability Panduit conducts extensive testing to measure product performance in extreme operating environments. They are designed to meet or exceed industry standards, and they also meet and exceed the performance standards set by various regulatory agencies worldwide. Through significant investment in research and development, as well as participation in industry standard bodies, Panduit provides products engineered for optimum performance, quick and dependable installations, and improved workplace safety.

By creating cost reductions across the entire lifecycle of these heavy duty vehicles, those partnering with Panduit can reap the financial benefits and pass that savings along to other areas of need.





Case Study: Vehicle Manufacturer Partners with Panduit to Modify Designs and Meet New Standard

Iveco/CNH Industrial Group is the only vehicle manufacturer to offer ecological diesel and natural gas engines on its entire range of vehicles, and the first full-line commercial vehicle manufacturer to develop engines optimized for use with compressed natural gas (CNG). The company builds special vehicles for applications like firefighting, off-road missions, the military, and civil defense.

Iveco/CNH has production plants in Europe, Brazil, Russia, Australia, Africa, Argentina, and China, as well as approximately 5,000 sales in over 160 countries. With 49 advanced research and development centers located around the world, teams of engineers and technicians research, design, and test new solutions to improve the reliability and productivity of vehicles and machines for approximately 150,000 commercial vehicles.

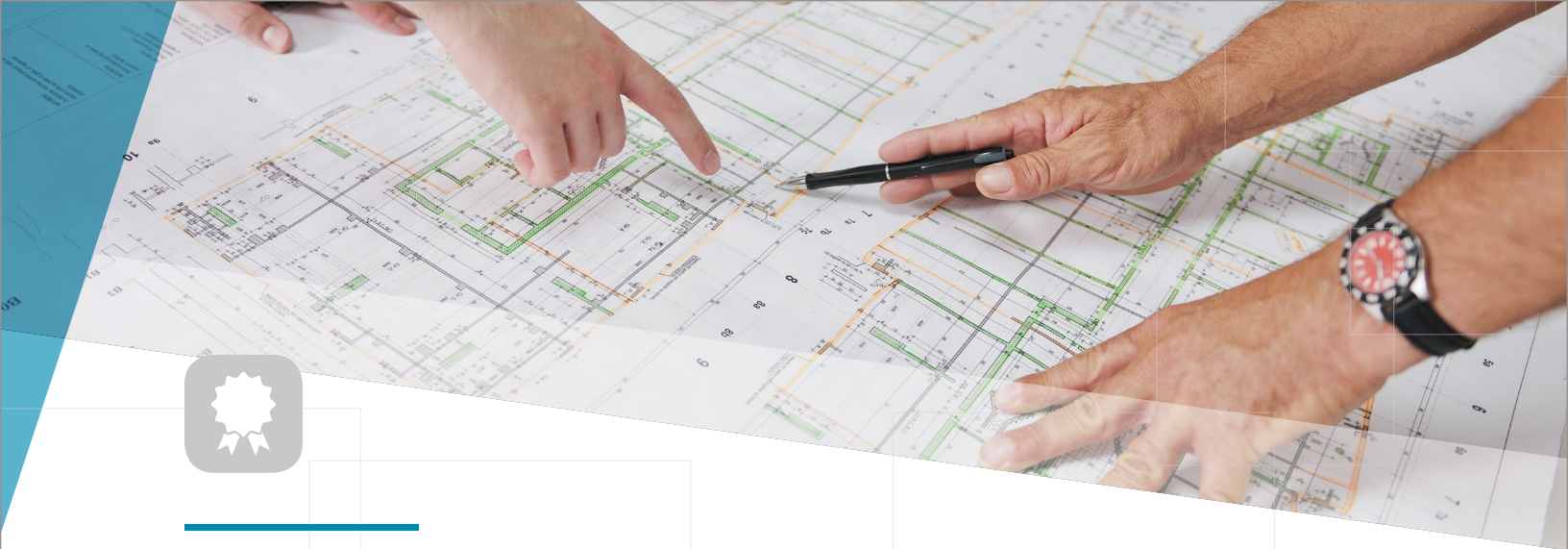
While Iveco/CNH Industrial Group knows vehicle manufacturing, the company needed to quickly modify current truck designs to comply with the Euro 6 standard, which defines the acceptable limits for exhaust emissions. To meet the standard, Iveco designed the Eurocargo truck to adhere to the requirements for exhaust emissions of NOx and other pollutants such as low energy consumption, and low pollution. Meeting the new standards requires operating at higher temperatures that demand specially designed products and materials.

In particular, the company needed to properly anchor two cables alongside the engine muffler of the truck. The solution to anchor those cables needed to withstand high temperatures up to 200°C, and also needed to be weather resistant and pass select chemical resistance tests. And it had to go on approximately 13,000 trucks – four cable tie mounts per truck – with the possibility of adding more vehicles in the future.

Because of Panduit's technical expertise and ability to propose a complete fastening solution – cable tie mounts, plastic and stainless steel cable ties, accessories, and installation tools – Panduit was selected to remedy the situation. Each product was specially selected to address a wide variety of application circumstances involving temperature, weathering, and other environmental impacts. Panduit offered a solution that delivers strength, longevity, and resistance in extreme environmental conditions while complying with the Euro 6 emissions standard, and also one that is European Conformity compliant for quality assurance and complies with Restriction of Hazardous Substances regulations.

To speed and simplify the mounting of its wires, cables, and tubing and increase harness build productivity, Iveco/CNH Industrial Group also deployed Panduit manual and automatic installation tools.

200°C
TEMPERATURE CABLE ANCHORS
NEEDED TO WITHSTAND



Consultative Engineering Assistance to Solve OEM Challenges

When it comes to the many design decisions and application issues encountered when creating heavy duty vehicles, it can be challenging to identify the cable management products best suited for each application. A reliable technical partner should offer consultative engineering assistance and share best practices with engineers that are designing, manufacturing, and maintaining these vehicles.

When it comes to the most challenging wire management application, customer service should go beyond simply supplying the recommended mechanical fasteners. A partner should work with OEMs to share application-specific best practices, offer an optional engineering review, and customize solutions to each OEM's individual application needs. Panduit has created a variety of custom solutions for the management of wires and bundles, pneumatic and hydraulic hoses, cables, and cab, engine, and chassis areas.

When it comes to the most challenging wire management application, customer service should go beyond simply supplying the recommended mechanical fasteners.

OEMs considering the adoption of robust wire and cable management solutions should also make use of their partner's application engineering expertise. From project start through successful completion, help should be offered to work with designers to identify the right products to achieve optimal application performance for the lowest possible installed costs.

A partner should also work to provide designers a material review to assess material capabilities and call attention to any issues related to high temperature, high vibration conditions, and UV exposure. They should evaluate installation practices to improve operational productivity while also identifying opportunities for part consolidation and material use reduction. To promote uptime and reduce lifetime cost of ownership, they should further develop a designer's tooling maintenance program.

Panduit works alongside OEMs to develop new products specifically for their application needs. By consulting multiple departments including production, engineering, and quality control, Panduit ensures custom solutions are built to optimize every step of the operation.



Value Delivered Through the Right Partner

The future is bright for the development of infrastructure projects, and any business-minded heavy duty transportation OEM will want to be a part of it. To fully take advantage, it's critical that your organization is manufacturing the most operational and dependable vehicles on the market. Implementing the right wire harness technology and partnering with the right manufacturer will ensure the vehicles your organization creates will exceed expectations and truly serve as an asset when and where they're needed most.

Implementing the right wire harness technology and partnering with the right manufacturer will ensure the vehicles your organization creates will exceed expectations and truly serve as an asset when and where they're needed most.

Panduit has more than 60 years of experience working with wire management applications and continuously reinvests in R&D. To date, Panduit has secured more than 2,000 patents, including several for wire harness products alone. With operations in 35 countries and customers in 120, Panduit distributes products, provides design expertise, and supplies technical support to customers on an international scale. Panduit is committed to helping organizations become more productive and profitable, and is always striving to put its partners ahead of their competition.





PANDUIT®

Since 1955, Panduit's culture of curiosity and passion for problem solving have enabled more meaningful connections between companies' business goals and their marketplace success. Panduit creates leading-edge physical, electrical, and network infrastructure solutions for enterprise-wide environments, from the data center to the telecom room, from the desktop to the plant floor. Headquartered in Tinley Park, IL, USA and operating in 112 global locations, Panduit's proven reputation for quality and technology leadership, coupled with a robust partner ecosystem, help support, sustain, and empower business growth in a connected world.

For more information

Visit us at www.panduit.com/en/solutions/wire-harness.html

Contact Panduit North America Customer Service by email: cs@panduit.com or by phone: 800.777.3300

THE INFORMATION CONTAINED IN THIS ARTICLE IS INTENDED AS A GUIDE FOR USE BY PERSONS HAVING TECHNICAL SKILL AT THEIR OWN DISCRETION AND RISK. BEFORE USING ANY PANDUIT PRODUCT, THE BUYER MUST DETERMINE THE SUITABILITY OF THE PRODUCT FOR HIS/HER INTENDED USE AND BUYER ASSUMES ALL RISK AND LIABILITY WHATSOEVER IN CONNECTION THEREWITH. PANDUIT DISCLAIMS ANY LIABILITY ARISING FROM ANY INFORMATION CONTAINED HEREIN OR FOR ABSENCE OF THE SAME.

All Panduit products are subject to the terms, conditions, and limitations of its then current Limited Product Warranty, which can be found at www.panduit.com/warranty.

* All trademarks, service marks, trade names, product names, and logos appearing in this document are the property of their respective owners.

PANDUIT US/CANADA
Phone: 800.777.3300

PANDUIT EUROPE LTD.
London, UK
cs-emea@panduit.com
Phone: 44.20.8601.7200

PANDUIT SINGAPORE PTE. LTD.
Republic of Singapore
cs-ap@panduit.com
Phone: 65.6305.7575

PANDUIT JAPAN
Tokyo, Japan
cs-japan@panduit.com
Phone: 81.3.6863.6000

PANDUIT LATIN AMERICA
Guadalajara, Mexico
cs-la@panduit.com
Phone: 52.33.3777.6000

PANDUIT AUSTRALIA PTY. LTD.
Victoria, Australia
cs-aus@panduit.com
Phone: 61.3.9794.9020