7 ESSENTIAL CABINET DESIGN CONSIDERATIONS FOR PROTECTING 19" ELECTRONICS

Depending on the application, choosing the right cabinet might be a challenge. Outside the traditional 19"data communications and telecommunications market, cabinets may be exposed to extreme heat, high dust/contaminants, clean room/ laboratories, Radio-Frequency/ Electromagnetic interference (RFI/EMI) and high shock and vibration requirements. To help choose a specific 19" electronics cabinet solution this article introduces seven essential design considerations.

ONE – Design Standards
Depending on your requirements different design standards can apply. Those are defined and developed by standards committees, government agencies, and regulators. Standards result from technical agreements related to design specifications and requirements that need to be fulfilled by a product or service. Some key design standards associated with electronics cabinets include the following:

IEC
International Electrotechnical Commission (IEC) develops International standards for all electrical, electronic and related technologies. Adoption is voluntary, although they are often referenced in national laws or regulations worldwide. IEC 60297 (Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series) standard provides crucial information for designing 19" cabinets – IEC 60297; IEC 60297-3-100 (19 inch Standard); IEC 60917-2-2 (25 mm metric Standard); ETS 300 119-2/-3 (European Telecommunication Standard).

RoHS Compliance
Restriction of Hazardous Substances. (RoHS), originated in the European Union and restricts the use of six hazardous materials found in electrical and electronic products.

MIL-S-901D is a special military test requirement designed for shipboard applications. Based on the type of equipment – essential or non-essential to the safety and combat-readiness of the ship – qualification testing is performed on a specified machine placed on a barge floating in a pond where explosive charges are detonated at various distances and depths in the pond to impart shock upon the equipment.

TWO – Cabinet Dimensions
19" cabinets provide a standardized frame or enclosure for mounting various types of electronics equipment. Each piece of equipment is typically 19 inches (482.6 mm) wide, including edges or mounting ears, which allow for mounting to the rack frame. Cabinet height is defined in "Units" (U), each unit equals an industry standard of 1.75 inches (44.45 mm). Rack-mountable equipment is usually designed to occupy a specified number of U. Cabinet depths may vary in accordance with diverse applications. Typical depths range 600-1200 mm. Detailed guidance regarding mechanical structure standards for 19-inch electronics may be referenced in IEC 60297-3-100.

THREE – Weight Load Capacity
The amount of weight loaded into a cabinet can vary widely, so it's important to take a look at this factor to determine the right type of cabinet for a given application. Whether it is several banks of batteries for uninterruptible power supplies, or an array of hard drives, proprietary equipment or other heavy components, underestimation of weight loading requirements is a very common frustration for engineers. It is especially

EXPERTS FROM AROUND THE WORLD COLLABORATE AND DEVELOP IEC INTERNATIONAL STANDARDS – MORE INFORMATION MAY BE FOUND ON THE IEC WEBSITE.

difficult because some tests may be conducted to ensure optimal results, such as mounting the heaviest equipment at the bottom of the cabinet, but it may not correspond to the layout for the final application.

Working with heavy loads can also present other issues. Depending on the application, some cabinet designs may require dynamic protection, which in turn, necessitates a more robust design depending on the load.

FOUR – Thermal Management and Cooling

Thermal management is an important design consideration for any electrical or electronics enclosure. Thermal overload can be a common reason for operating failures in electronic devices, and the risk increases for equipment mounted into cabinets as power density of today's electronics increases, and more heat is generated. Heat dissipation calculations are measured in ΔT (Delta T), which is defined as the temperature difference between the intake air and exhaust air, or the amount of heat that is carried away by the stream of air exiting the heat load. A greater temperature difference signifies more heat being removed.

Cabinets designed for universal applications require broad thermal management compatibility and often need to meet more stringent performance demands than standard communications cabinets. There are numerous thermal management and cooling options that may be deployed in cabinets - from high perforation—which is referred to as a passive option—to fan trays, heat exchangers and air conditioners—which are considered active options.

A GREATER TEMPERATURE DIFFERENCE SIGNIFIES MORE HEAT BEING REMOVED.

Additional information regarding heat management design standards and recommendations are defined in IEC 61587-1.

FIVE – Shock & Vibration Protection

There are two main dynamic requirements – seismic and shock/vibration (S/V) tests. It is worth pointing out that S/V and seismic tests are very different and have very well-defined processes on loading cabinets with weight. Retesting with exact equipment is needed to ensure that the final solution offers the same S/V or seismic protection as desired. The test may not be needed if the equipment is below the threshold of the official test.

Shock and Vibration

This test is a go-to test for equipment that will be used in mobile applications and simulates a typical environment in a train car, vehicle or next to vibration-generating equipment such as a punch press or other piece of industrial equipment. Minimization of weight and S/V-optimized designs offer long-term benefits to users, especially in transportation applications.

Seismic

Seismic activity is a very complicated, but well-studied phenomenon. Testing equipment and processes are well-defined and well-known with multiple labs capable of doing tests. The test consists of placing a fully loaded, standard cabinet on a platform that can move in any direction and simulate the earth's movements during a seismic event. Certain deformation and movement of the cabinet can lead to test failure.

SIX – Electromagnetic Compatibility (EMC)

Electromagnetic interference (EMI) has been a growing concern with equipment manufacturers. As equipment becomes faster and proliferates into all types of manufacturing and production environments the issue of EMI has become more prevalent. Environments that were once considered EMI-free are becoming more and more susceptible to interference due to an increase in automation equipment and electronics emissions. Visual inspection alone of cabinet gaskets does not suffice to ensure adequate EMI protection.

Proper tests and results are needed to ensure that a cabinet design meets those requirements. Gasket integration to provide a Faraday effect is not a simple matter – competing with requirements such as cabinet cooling and perforations for air flow. The latter demands an understanding of the entire system, not just individual components, and necessitates a number of accessories that may seem redundant but solve very specific problems. Additional design requirements and recommendations can be referenced in IEC 61587-3.

SEVEN – Environmental & Safety

IEC 60529 provides guidance for classifying the ingress protection rating (IP Codes) of enclosures. IP deals with dust and water protection. Equipment that has better protection against dust/objects and water will have higher ratings. IP ratings have two numbers - one shows dust/object protection and the other shows water protection. There are some industries where the requirement might be higher than in others - transportation, military and food and beverage industries are just a few that might have high requirements for IP rating due to the nature of the intended applications as compared to other industries. It is beneficial to partner with a supplier that has a solid understanding of the various requirements, has built various types of IP cabinets and can show test reports.

Schroff

CONCLUSION

When designing 19" electronics enclosures outside of traditional data and telecommunications applications, it is critical to partner with a provider who has a demonstrated history of working within stringent global design standards, and is able to work with you to provide the right cabinet solution that meets the performance requirements of the entire system. Schroff, a division of Pentair Technical Solutions, is a global leader in electronics protection, and offers high-quality electronic packaging design and fabrication including complete systems,

INDIVIDUAL PACKAGING SOLUTIONS AND DEMANDING CUSTOMIZED SOLUTIONS.

ABOUT PENTAIR TECHNICAL SOLUTIONS

Pentair Technical Solutions is a global leader of systems and solutions that safeguard industrial controls, electrical components, communications hardware, electronic devices, and electrical heat management systems. Its premier brands Hoffman, Raychem, Schroff and Tracer provide a comprehensive range of standard, modified and custom engineered solutions for the energy, industrial, infrastructure, commercial, communications, medical, security and defense markets.
The Schroff brand contains a broad portfolio of products from printed circuit board (PCB) accessories, such as card retainers, conduction cooled frames, front panels and handles to subracks, cases, backplanes, power supplies, cabinets and pre-assembled chassis for embedded computing systems For more information, visit www.pentairprotect.com

ABOUT PENTAIR PLC

Pentair plc (www.pentair.com) delivers industry-leading products, services and solutions for its customers' diverse needs in water and other fluids, thermal management and equipment protection. With 2014 revenues of $7.0 billion, Pentair employs approximately 30,000 people worldwide.

	SECURITY / DEFENSE	GENERAL ELECTRONICS	IT	MEDICAL	INDUSTRIAL	INFRASTRUCTURE
SHOCK AND VIBRATION	●●●	●○○	●○○	●○○	●●○	●●○
SEISMIC	●●○	●○○	●○○	●○○	●○○	●○○
HEAT	●●○	●●○	●●●	●●○	●○○	●●○
WEIGHT	●●○	●○○	●●●	●○○	●○○	●●○
IP	●●○	●●○	●○○	●●○	●●●	●●○
EMI / EMC	●●●	●○○	●●○	●●○	●●○	●●○

●○○ LOW REQUIREMENT ●●○ AVERAGE REQUIREMENT ●●● HIGH REQUIREMENT

CONTACT:

PENTAIR TECHNICAL SOLUTIONS GMBH
+49.7082.7940

FOR FURTHER INFORMATION VISIT: WWW.PENTAIRPROTECT.COM