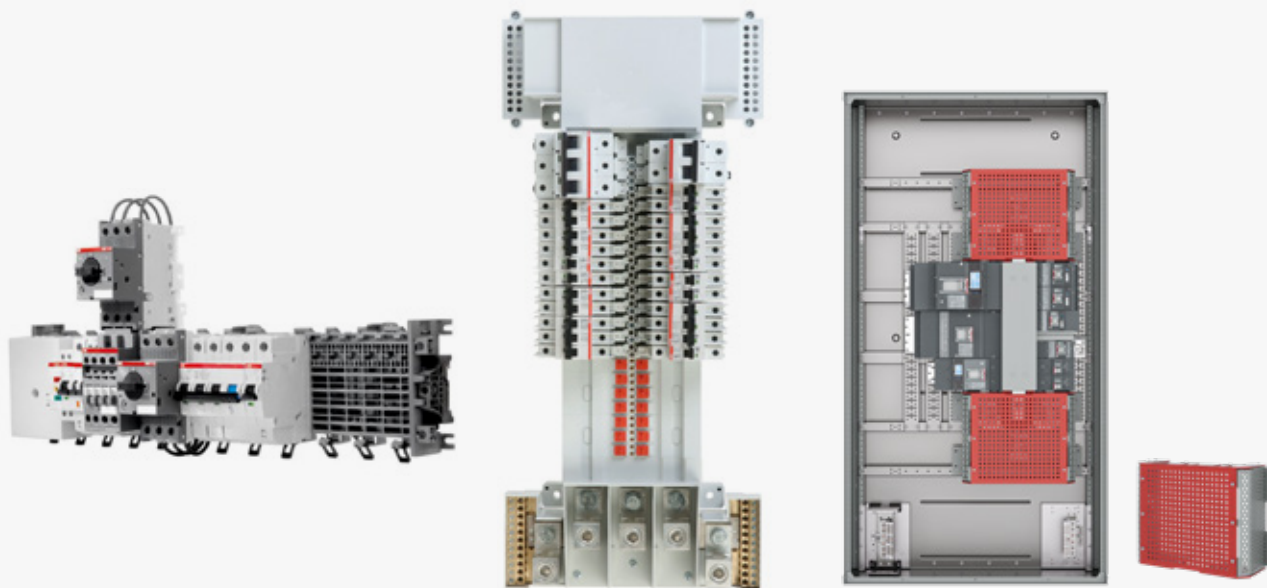


How IEC IP20 can help protect your employees



OSHA electrical safety requirements

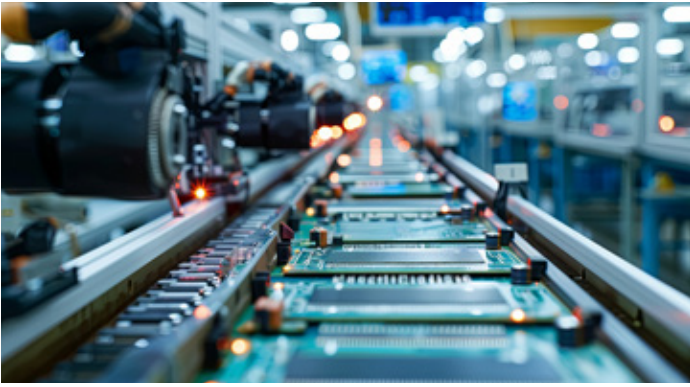
In the U.S., the Occupational Safety and Health Administration (OSHA) oversees safety standards for employees working around and on charged electrical equipment. In particular, **29 CFR 1910.333(a)(1)** requires that live components be de-energized before the employee works on or near them. Yet, even OSHA recognizes that this is not always feasible. In those instances, the requirement is on the employer to demonstrate that either:

1. De-energizing introduces additional or increased hazards, such as the interruption of life support equipment, deactivation of emergency alarm systems, shutdown of hazardous location ventilation equipment or removal of illumination for an area.¹
2. De-energizing is infeasible due to equipment design or operational limitations, such as in a continuous process in a chemical plant where the entire process would need to be shut down simply to work on one circuit or piece of equipment.²

De-energizing presents operational challenges

Many industries have essential processes that, once started, cannot be stopped without creating service issues or turning potentially millions of dollars of raw and semi-processed materials into scrap.

Pharmaceutical processing — In pharmaceutical manufacturing, even a short disruption to processes can cause parameters to drop out of acceptable range, thereby introducing potentially dangerous quality defects into finished products. For example, an unexpected stoppage can lead to issues such as the settling of suspended particles, changes in temperature-sensitive components or reaction kinetics that deviate from the designed parameters. These changes can affect the efficacy, safety and shelf-life of the final product.



Food manufacturing — Deadly bacteria, such as *Listeria*, can build up in many foods if temperatures rise mid-process. These manufacturers, as well as pharmaceutical processors, must also maintain a cleanroom-level production environment. De-energizing systems associated with HVAC equipment can introduce particulate and microbial contamination.

Metal plating — Once the electrical current is applied to drive the deposition of metal ions onto the substrate, stopping the electroplating process can lead to uneven coatings, poor adhesion or defects in the plating layer. Interrupting other metal plating processes, such as chemical vapor deposition (CVD), anodizing and thermal spraying, can also lead to suboptimal results.

Semiconductor fabrication — Creating integrated circuits on silicon wafers involves several highly complex and sensitive processes, such as photolithography, CVD, atomic layer deposition (ALD), ion implantation and more. Interrupting these processes may lead to defects and reduced yield or even necessitate the scrapping of the wafer.

Data centers — While not a continuous flow manufacturer like the above examples, data centers support a wide array of these processes and those of many other businesses. To ensure continuous service, data centers implement various degrees of system redundancy. Nevertheless, there are instances where interrupting electrical power for maintenance activity could drop service levels below agreed-upon standards.

Working on or around energized equipment is dangerous, but it can be necessary. If the decision is made to work under these conditions, and the parameters outlined by OSHA are met, IP20 helps provide an extra layer of protection for employees.

IP20 explained

The IP20 rating is a classification defined by IEC 60529 that specifies the degree of protection against the ingress of solid objects and liquids. The “IP” stands for “Ingress Protection,” and the two numbers following it define the protection level.

The first digit indicates protection against solid objects or materials. Specifically, the “2” in IP20 means the enclosure is protected against solid objects larger than 12.5 millimeters, such as fingers. (See Figure 1.) The second digit defines the level of protection against liquids. In this case, an IP20 casing is not designed to protect against liquids. In other words, IP20 equipment is well suited to prevent unintentional touching of conductive components. However, it is not designed to be used in a wet environment, such as outdoors or in a high-humidity processing environment.

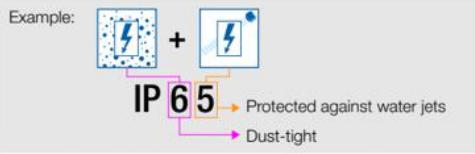

NEMA vs IP20

The National Electrical Manufacturers Association (NEMA) standards body are widely used in the North American electrical industry. NEMA sets standards that define products, processes or procedures such as safety, functionality and interoperability for products implemented within the U.S.

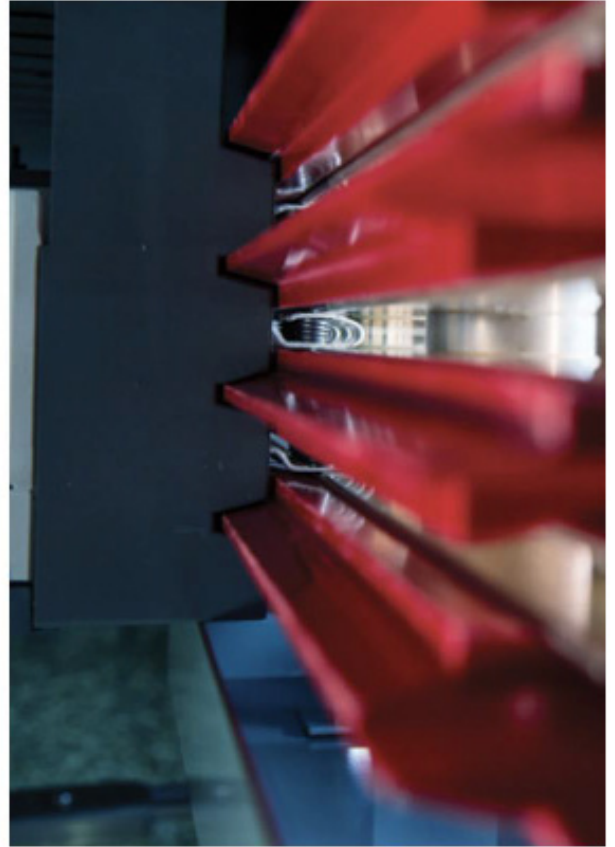
For many applications, the NEMA rating system is useful because it defines a more comprehensive range of protections, including against solid objects and liquids (similar to IEC standards) and other environmental factors such as corrosion, oil and coolants. However, the NEMA standard is only applicable to the enclosure, whereas the IP20 rating can apply to enclosures as well as the plastic coverings and encasings around individual components.

Ingress protection (IP) ratings guide

IP ratings are represented by combining the first and second digits of the below columns

1 st numeral - solid foreign objects		2 nd numeral - water	
0	No protection	0	No protection
1	Protected against solid foreign objects of 50 mm Ø and greater	1	Protected against vertically falling water drops
2	Protected against solid foreign objects of 12,5 mm Ø and greater	2	Protected against vertically falling water drops when enclosure tilted up to 15°
3	Protected against solid foreign objects of 2,5 mm Ø and greater	3	Protected against spraying water
4	Protected against solid foreign objects of 1,0 mm Ø and greater	4	Protected against splashing water
5	Dust-protected	5	Protected against water jets
6	Dust-tight	6	Protected against powerful water jets
Example: 		7	Protected against the effects of temporary immersion in water
 Making electrotechnology work for you.		8	Protected against the effects of continuous immersion in water
		9	Protected against high pressure and temperature water jets

01 ReliaGear® panelboard and switchboard designs come with an improved finger-safe bus stack that meets IP20 standards



01

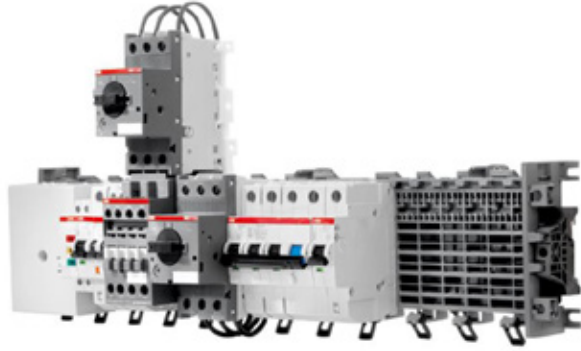
The standards ecosystem

While this paper focuses on IP20, other standards may apply to specific applications. NEMA is one that has already been mentioned. In addition, the “Standard for Electrical Safety in the Workplace,” also known as NFPA 70E, is a standard published by the National Fire Protection Association (NFPA). Its primary purpose is to provide guidelines to protect electrical workers from shock, arc flash and arc blast hazards while installing, maintaining or repairing electrical systems. NFPA 70E also covers the safety-related work practices and requirements for working on or near live electrical equipment.

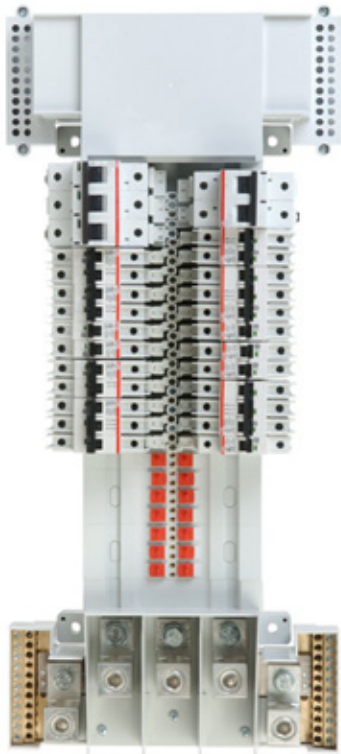
These standards are interconnected, with OSHA setting the overarching requirements, and individual standards, such as NEMA, NFPA 70E, and IEC, providing more detailed standards and procedures that must be followed when working on live equipment. Understanding this ecosystem of related standards is essential for fully addressing the safety and compliance considerations around live electrical work.

An extra layer of protection

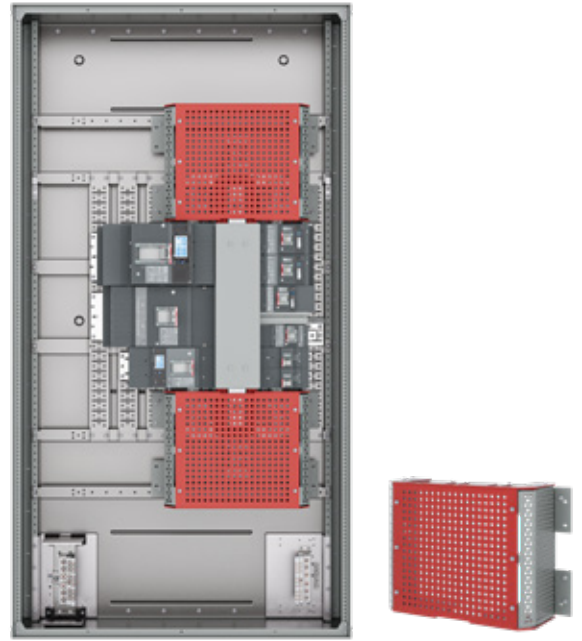
As a global company, ABB has a front-row seat to safety designs and best practices worldwide. While largely a European standard, developing IP20-rated solutions provides our customers with an extra layer of protection, especially if the conditions outlined by OSHA are met. We’ve incorporated the IP20 rating into the distribution section of ABB switchboards, ReliaGear® neXT power panelboards, and across the full product for our “touch-proof” portfolio of interiors, including SMISLINE TP and ProLine for UL 508 and UL 67 applications.



SMISLINE TP, the world's first plug-in socket system, has a unique integrated bus bar design, allowing the assembly to remain fully touch-safe (IP20) even when plugging in and unplugging devices. [Learn more.](#)



ABB's ProLine panelboard provides unparalleled IP20 protection for UL 67 applications. It offers touch-safe neutral bar connections, a resin-enclosed bus bar system and separate mechanical and electrical connections, keeping conductive components out of reach. [Learn more.](#)



ReliaGear® neXT power panelboards include an IP20 finger-safe bus stack and optional IP20 finger-safe barriers for main breakers, main lugs, feed-through lugs and feeder breakers. [Learn more.](#)

Making the world a safer place

An increasingly electrified world comes with inherent risks, especially for those whose job requires working on or around electrical equipment. ABB is committed to protecting the safety of our customers and those who rely on the power they provide, offering solutions that adhere to the many industry safety standards, such as IP20, NFPA and OSHA.

¹ United States Department of Labor, Occupational Safety and Health Administration, Selection and Use of Work Practices, <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.333>

² United States Department of Labor, Occupational Safety and Health Administration, Selection and Use of Work Practices, <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.333>