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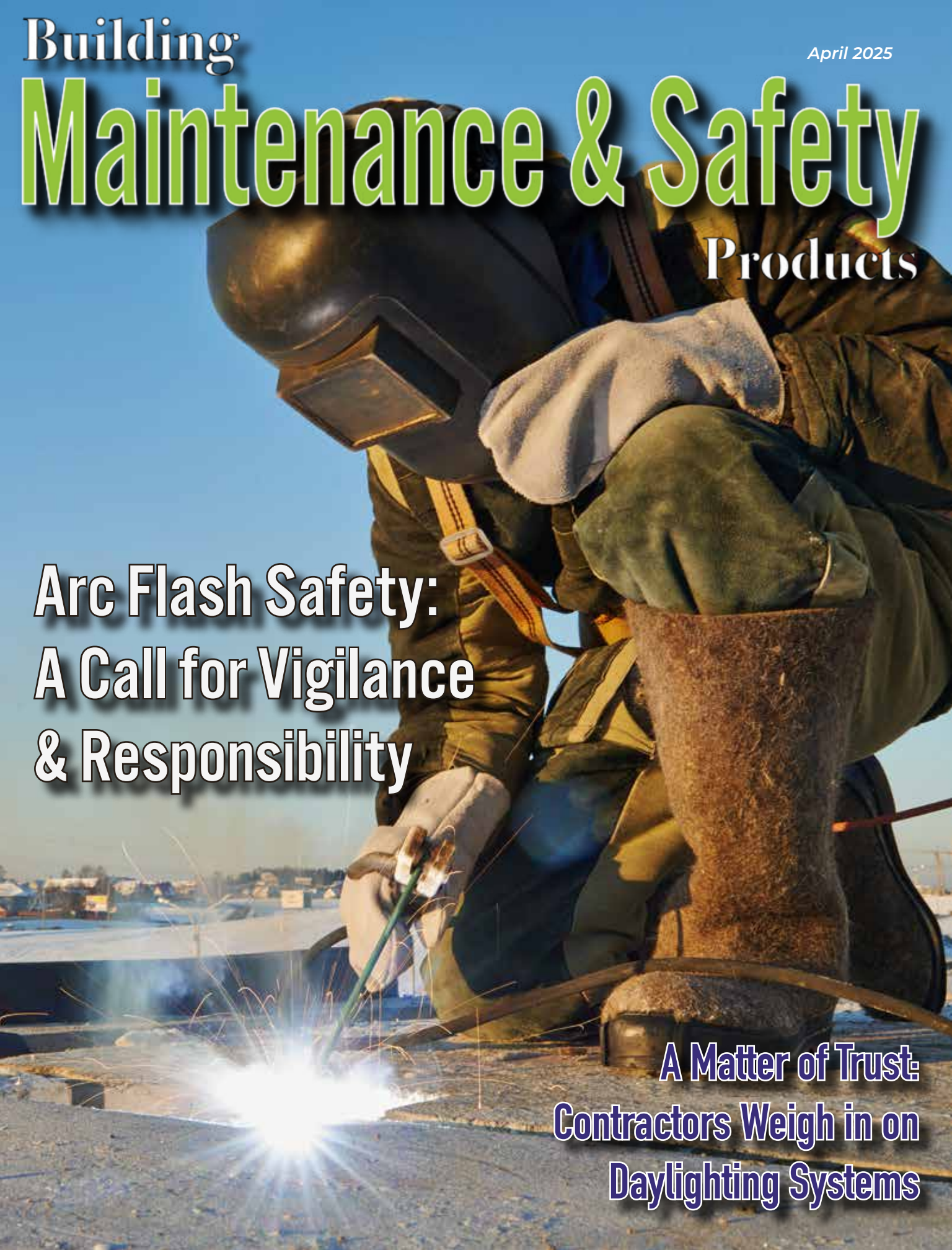
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Products






**Arc Flash Safety:  
A Call for Vigilance  
& Responsibility**

**A Matter of Trust:  
Contractors Weigh in on  
Daylighting Systems**



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PG 4	Company Profile: Grace Industries Inc
PG 6	Arc Flash Safety: A Call for Vigilance & Responsibility
PG 10	A Matter of Trust: Contractors Weigh in on Daylighting Systems
PG 14	11 Parts of an Electrical Transformer
PG 22	Ad Index



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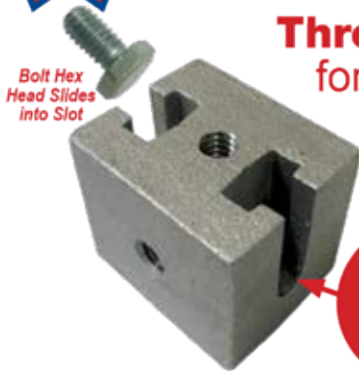
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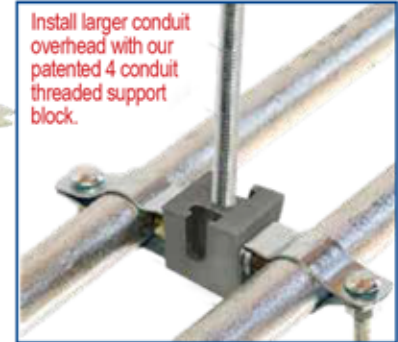
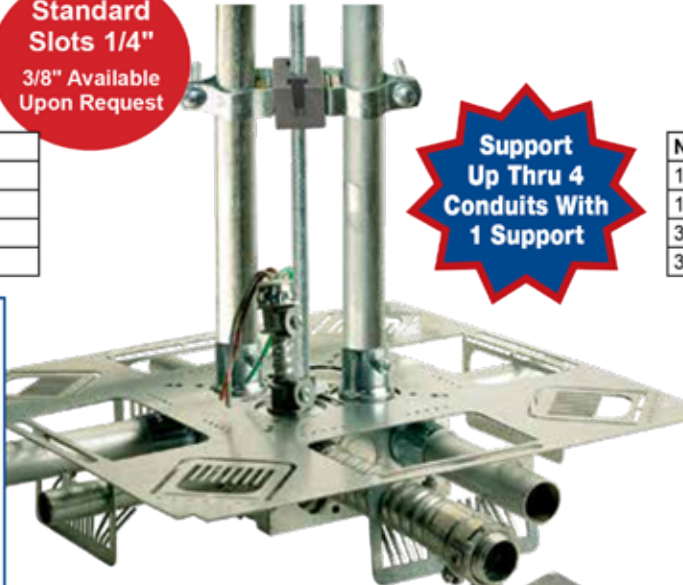
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*Overview:*

Grace Industries, Inc. is a U.S.-based manufacturer that designs and produces personal safety and emergency signaling products, primarily for firefighters, emergency responders, industrial workers, and military personnel. Their focus is on life-safety equipment that can alert others if a worker becomes incapacitated or in distress.

*Founded:* 1974

*Headquarters:* Fredonia, Pennsylvania, USA

*Industry:*

- Personal Safety Equipment
- Emergency Signaling Systems
- Worker Safety Solutions

*Products:*

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- Evacuation Systems — emergency communication and alert devices.
- Accountability Systems — tracking and monitoring systems for emergency teams.
- Wireless Safety Solutions — for both indoor and outdoor industrial environments.

*Notable Technologies:*

- Motion-sensing alarms
- Wireless telemetry and signaling
- Rugged, waterproof designs for extreme conditions

*Clients / Users:*

- Fire departments
- Oil and gas industries
- Mining operations
- Military and law enforcement agencies
- Industrial companies with hazardous environments



*Core Mission:*

To enhance the safety and survival of individuals working in hazardous environments through innovative signaling and alert systems.

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(you can find full product catalogs and support resources there)



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# Arc Flash Safety: A Call for Vigilance & Responsibility



In the world of electrical work, few hazards are as sudden and devastating as an arc flash. In an instant, temperatures can soar to over 35,000 degrees Fahrenheit—four times hotter than the surface of the sun—releasing explosive energy capable of causing catastrophic injuries, equipment destruction, and even death. Yet, despite these staggering risks, arc flash incidents continue to occur with alarming regularity, often stemming from preventable causes.

Arc flash safety is not just a regulatory checkbox; it is a profound ethical responsibility. Every worker who approaches energized equipment deserves the full protection of diligent safety practices, modern technology, and a culture that prioritizes life over convenience.

The foundation of arc flash safety is education. Workers must understand not just how to work safely, but why each precaution is necessary. Too often, familiarity with a task breeds dangerous complacency. Ongoing, high-quality training can reframe routine activities through a lens of risk awareness and ensure that critical procedures are followed even under pressure.

Equally important is the commitment to thorough and accurate arc flash risk assessments. Companies must invest the time and resources to properly label equipment, calculate incident energy levels, and develop clear, actionable safety plans. Cutting corners, whether to save money or meet deadlines, is an invitation for tragedy.

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Proper personal protective equipment (PPE) serves as the last line of defense. While no gear can make an arc flash “safe,” PPE dramatically increases the odds of survival and recovery. It must be chosen based on the specific risk assessment of the task and worn correctly every time—not just when it’s convenient.


However, even the best PPE and training are insufficient without a workplace culture that empowers employees to speak up and stop work when safety is compromised. Leadership must set the tone, modeling safety-first behaviors and refusing to prioritize production over people. True commitment to safety is visible, consistent, and uncompromising.

The good news is that arc flash incidents are largely preventable. Advances in technology—

such as arc-resistant switchgear, remote racking devices, and maintenance-mode settings—are making hazardous work safer than ever before. But technology alone is not a substitute for vigilance.

Each injury avoided, each life saved, is a testament to a company’s character and values. Arc flash safety is not about fear; it is about respect—respect for the forces we harness, for the lives we touch, and for the families who expect their loved ones to come home safely every night.

Safety is a journey, not a destination. In the realm of arc flash hazards, that journey must be traveled with humility, commitment, and unwavering resolve. •



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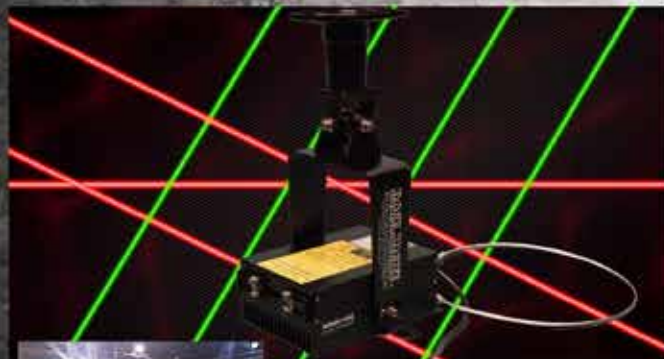
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# A Matter of Trust: Contractors Weigh in on Daylighting Systems



*Contractors place their trust in rooftop systems that provide brilliant, diffused daylight to interior spaces with easy installation and high level of leak-free reliability*

Natural sunlight has long been known to be superior to any kind of artificial light source. It contains the full spectrum of colors and studies show that people are generally happier and healthier living, working, and shopping in sunlit environments. Although windows enable natural light to enter a building, organizations often use artificial lighting inside. Today, many seek to allow natural lighting to illuminate the interior.

As a result, business and warehouse owners are turning to daylighting systems to reduce and sometimes even eliminate the need for artificial lighting during the day. Daylighting systems, which passively harness and enhance the sun's light, are not simple skylights. Rather, applying physics to standard glass domes facilitates and diffuses the light entering a building without harshness or glare. These energy-efficient systems can evenly illuminate building interiors of any size with pleasing daylight. The dramatic effect floods the space with bright light, enabling true color perception, which is crucial for selling many products.

Even with these tangible benefits, the contractor is usually focused on ease of installation and reliability. The contractor's prime concern typically is "After the job, can I sleep

at night without worrying about getting a callback [for leakage] after the first rain?"

After all, any penetration of a watertight roof membrane can introduce a potential pathway for water, which no one wants. So, contractors need exceptional trust that the systems they install will have a high level of leak-free integrity.

In the industry, one reliable daylighting system, Campbell Hill, IL-based DayStar Skylight Systems, is specifically engineered for leak-free installation. Contractors make it clear to their customers that the installation process gives them confidence in its watertight integrity.

The DayStar system is composed of four parts. First, sunlight is gathered and diffused through an ultra-clear outer dome and inner collimation lens. A light shaft made of insulated panels with highly reflective interior surfaces amplifies natural light as it is captured. And finally, an attractive ceiling lens, engineered to diffuse highly concentrated light into a broad lighting pattern, is installed on the interior ceiling. The product comes in three common sizes, 2'x2', 2'x4', 4'x4', although others are available.

As a general contractor for 30 years, Jonas Yoder, owner

*"As a safety professional, you always want your workers to have access to leading edge safety tools that improve safety and focus. Working with **COOLSHIRT SYSTEMS** over the past two years allowed me to help design a tool by lineman for lineman."*

*The **A.R.C. Hybrid Cooling System** by **COOLSHIRT SYSTEMS** allows lineman to remain more focused and less fatigued by reducing their core body temperature in extreme environments, therefore reducing the possibility of unintended accidents."*

**-James "Jim" Bonner**  
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of JY Construction, has installed many natural daylighting systems.

“For natural lighting in roofing I wouldn’t think about installing anything but a DayStar system because the lighting and reliability is superior. It is a quality product that you can install without a leak. With other choices, you may get callbacks when they leak,” says Yoder.

According to Yoder, in other systems he has used the fiberglass construction is prone to distortion, which diminishes the natural light over time. In addition, when cracks emerge in the fiberglass, leakage occurs.

#### *Custom Engineered Roof Curbs*

One of the reasons for DayStar’s reliability is how the system is designed and engineered to prevent leaks. This begins with a properly installed essential roof curb that ensures the daylighting components have a level platform for attachment.

Rooftop curbs are raised metal frames designed for mounting structures safely to the roof. Typical skylights are comprised of a dome with pre-attached metal flashing, which the contractor cuts around to fit into an opening, and then seals with caulk. However, this arrangement is more prone to leakage. Some manufacturers rely on the contractor to find a supplier for a roof curb or even to create their own.

In contrast, DayStar’s insulated roof curbs are made of galvalume steel or aluminum, and feature continuously welded watertight seams. The curbs can be fitted to almost any roof pitch and metal rib design. The systems also come in regular slope and ridge-mounted versions. The company also supplies rib caps to fit the roof panel as well as the mastic sealant to be applied between the roof curb flange and roof metal. All these elements are crucial to DayStar’s unique engineering to create a well installed, leak-free system.

“DayStar puts out a nice curb, and they will really work with you on different configurations to make it [function well] with different roofs or roof profiles. As I’ve collaborated with them for about 15 years, I’ve asked them to change little things. They are always very adaptive to what I need, which helps to facilitate leak-free installation,” says Yoder.

#### *Thermal Efficiency*

After concerns about potential water leaks, many contractors seek a system that will prevent outdoor hot or cold air intrusion, or transfer through the components. The challenge is that typical daylighting manufacturers utilize a roof jacket which incorporates a tube like an uninsulated stove pipe that allows hot or cold air to enter.

In contrast, DayStar uses an insulated roof curb, double-glazed top dome with a vinyl thermal barrier. The system’s insulated, enhanced light shaft and lens provide a 40-50% better thermal value than other daylighting designs. In addition, the system has a low solar heat gain coefficient (SHGC) as well as U Values (a measure of insulating performance) that are over twice the thermal efficiency ratings of common skylights. This means the customer will lose less heat in the winter and gain less heat in the summer.

“The [DayStar] daylighting system insulates against indoor heat or cooling loss better than any other system I have seen,” says Yoder.

#### *Installation Instructions*

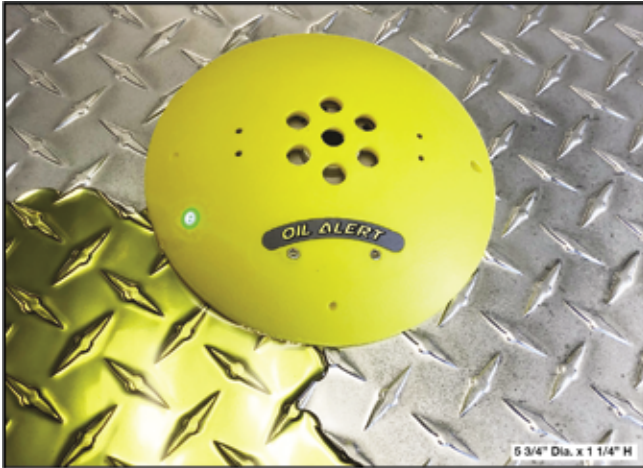
The daylighting installation process is quite simple, and a contractor does not need any special experience to perform an expert job. A general roofing contractor can read the installation manual and be certain that he understands the installation process because every detail is covered, step by step. DayStar also provides phone support for contractors. The units come as a complete package with all the materials needed for installation.

#### *Trust Earned*

If the contractor follows the instructions for the DayStar daylight system, it can provide many years of reliable service without worry over rain leakage.

According to Yoder, he originally installed 40 DayStar systems in a 24,000 sq. ft. pre-engineered steel building about 10 years ago. “Now, the same, industrial warehouse customer looking to build another 9,000 sq. ft. structure with 12 more daylight systems. In my mind, that shows their long-term value and reliability,” he concludes.

For more information on natural daylighting systems, email [info@daystar1.com](mailto:info@daystar1.com) or call (618) 426-1868. •



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# 11 Parts of an Electrical Transformer





Transformers are crucial to electrical system infrastructure, function and power. They transfer energy to one or more electrical circuits, increasing or decreasing the voltage without changing the frequency. This is necessary for appliances to function correctly without the risk of an electrical hazard.

A transformer has several parts, each serving a unique purpose to enhance the overall operation of these machines. These include:

- Laminated core
- Windings
- Main tank
- Insulating materials
- Transformer oil
- Cooling tubes or radiators
- Conservator tank
- Dual voltage switch
- Control box and fans
- Pressure relief device (PRD)
- Tap changer

The core, windings, insulating materials and tank are features of almost all transformers, from isolation to distribution transformers. All other components are seen in machines above a certain kilovolt-amp (kVA). Let's look at each part in more detail.

### **1. Laminated Core**

A transformer's core allows electromagnetic flux to pass easily via a low-reluctance path and supports primary and secondary windings. It is typically made with stacked sheets of either silicone steel or soft iron separated by a thin insulating material. These sheets help reduce eddy current loss, prevent hysteresis loss and allow for magnetic path continuity.

The exact design of a unit's core will depend on its current, voltage and frequency. However, its diameter is often directly proportional to the loss of copper and inversely proportional to the loss of iron.

### **2. Windings**

There are always two sets of windings — the primary and the secondary. These are made from several turns of copper or aluminum bundled together. Copper is most commonly used as it is one of the most conductive metals, whereas aluminum is only around 60% as conductive. Both are insulated from each other and are wound around the core.

Windings are classified based on either the supply's input and output or on the supply's voltage level. When classifying based on input or output, the windings are:

*Primary:* This winding is connected to the input supply.

*Secondary:* This winding takes the output load.

The primary winding is connected to the electrical source, which generates the magnetic flux. The magnetic flux passes through the core to the secondary winding, completing the movement and creating a magnetic circuit.

However, windings are also classified based on the voltage level:

- High voltage: This winding is connected to the higher voltage and can either be the primary or the secondary. It is generally made from a thin copper conductor with a larger number of turns.
- Low voltage: This winding is connected to a lower voltage. It can also be primary or secondary. Unlike their high-voltage counterparts, low-voltage windings are usually made from a thicker conductor with fewer turns.

### **3. Main Tank**

Also known as the casing, the main tank is one of the most sturdy parts of a transformer. It houses the windings, core and all other components and protects them from the external environment.

These tanks are typically made from steel, yet aluminum is becoming increasingly popular to help reduce the weight of these parts. Aluminum is a lighter metal, only weighing one-third as much as steel.

### **4. Insulating Materials**

Every transformer requires insulation to isolate both sets of windings from each other, the core and other parts made from conducting materials such as the tank. As 70% to 80% of all transformation failures result from internal winding insulation faults, the insulating materials are considered the most important electrical transformer parts.

Ideal insulating materials have excellent dielectric strength, beneficial mechanical properties and high temperature resistance. Paper, cardboard and cotton are often used as insulation, and transformer oil is also an insulating material.

### **5. Transformer Oil**

Transformer oils are usually hydro-carbon mineral oils that are either paraffin- or naphtha-based. Along with providing additional insulation between the windings in oil-immersed transformers, this oil also cools the core and coil.

Due to its chemical properties and dielectric capabilities, transformer oil transfers the heat created by the core and windings to the external environment. Once the windings heat up due to the current's flow, the oil cools these parts as it circulates inside the machines and displaces this heat via cooling tubes.

### **6. Cooling Tubes or Radiators**

Cooling tubes or radiators cool the transformer oil. Oil circulation in the transformer can either be forced or natural.

With forced circulation, an external pump is necessary. If the circulation is natural, the hot oil moves upwards when the temperature rises, and the cold oil moves downwards, naturally circulating in the tubes.

### **7. Conservator Tank**

The conservator tank is a metallic, airtight, drum-like structure that sits on top of the main tank. The primary function of the conservator is to allow the oil to expand and contract according to changes in the ambient temperature inside the tank. When the transformer heats up, the oil expands and flows into the conservator tank. As it cools, the oil contracts and moves back into the main tank, helping to ensure a balanced oil level.

This process is vital for the transformer's operation, as it allows other components to be constantly submerged in oil, keeping air out of the system and protecting insulation and cooling properties. As a result, there is a much lower risk of that machine overheating, which could result in suboptimal performance, unnecessary wear and tear, and even failure. The conservator tank controls oil levels and temperatures, promoting a transformer's longevity and efficiency.

### **8. Dual Voltage Switch**

Dual voltage transformers can supply power at two different voltages. If the two windings have a series connection, the output will be the sum of both voltages. The total voltage will be lower if they have a parallel connection.

A dual voltage switch is essential to alternate between the different voltages according to the necessary output. This switch is typically located outside the main tank.



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## 9. Control Box and Fans

The control box and fan are two indispensable components of a transformer. Control boxes manage the voltage and current that moves through these machines, helping to balance the load on the grid and ensure an even and efficient distribution of electricity. Transformer control boxes also shield the grid from failures and faults using fuses, surge arresters and circuit breakers to avoid overloads, short circuits and other issues.

However, control fans have a multifaceted role:

- They can reduce the amount of noise a transformer generates.
- They dissipate the heat in the transformer, helping to maintain an ideal temperature and improve the stability of these machines.
- Transformer fans can also boost insulation, helping to properly disperse static electricity and lower the risk of electrical accidents.

## 10. PRD

In the case of a severe internal fault, the tank's pres-

sure may rise to dangerous levels. Mounted on top of the transformer, PRDs protect transformers from sudden increases in pressure by ensuring this pressure can be released, preventing a potential rupture or explosion.

The way these devices work is simple — if pressure levels exceed a safe limit, a valve cap opens to expel oil and hot air gases, depressurizing the tank. Once the levels return to normal, this cap returns to its leak-tight, closed position.

## 11. Tap Changer

Tap changers change the transformer's output voltage, also known as its secondary voltage, by adjusting its turn ratio. There are two types:

On-load: With this tap changer, tapping can be adjusted without disconnecting the transformer from the supply. As a result, it can function without interrupting the power supply.

Off-load: Conversely, with this changer, the transformer must be disconnected from the supply to change its turn ratio.

Some transformers have automatic tap changers.

## Contact Sunbelt Solomon for Your Transformer Needs

*If you understand the various parts of a transformer, you'll likely understand these machines and how they work much better. With so many key components, regular maintenance and timely repairs are non-negotiable to help ensure your transformer functions at its prime. With 100 years of combined experience, Sunbelt Solomon is here to be your trusted partner.*

*We are the nation's leading field service and maintenance specialist and offer comprehensive repair and replacement services. With our engineering capabilities, commitment to safety and various environmental qualifications, we will keep your equipment working as it should. We know experiencing issues with your transformer can be highly disruptive, so we also provide high-quality rentals to help you minimize downtime.*

*To learn more about our services, contact us today.*

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Company	Pg.	Website
American Slip Meter	7	<a href="http://www.americanslipmeter.com">www.americanslipmeter.com</a>
Base Tek	5	<a href="http://www.basetek.com">www.basetek.com</a>
Cool Shirt	11	<a href="http://www.coolshirt.com">www.coolshirt.com</a>
CopperWeld	21	<a href="http://www.copperweld.com">www.copperweld.com</a>
Dorlen	13	<a href="http://www.oil-alert.com">www.oil-alert.com</a>
EDE	2	<a href="http://www.edeinst.com">www.edeinst.com</a>
Emsco	20	<a href="http://www.emscomn.com">www.emscomn.com</a>
Essex Steel	17	<a href="http://www.essexsteel.com">www.essexsteel.com</a>
Grace Industries	BC	<a href="http://www.graceconnectedsafety.com">www.graceconnectedsafety.com</a>
Jesco	1	<a href="http://www.jesco.com">www.jesco.com</a>
Krenz Vent	18	<a href="http://www.krenzvent.com">www.krenzvent.com</a>
Lignomat	8	<a href="http://www.lignomat.com">www.lignomat.com</a>
LTBL Tech	9	<a href="http://www.ltbltech.com">www.ltbltech.com</a>
Maddox	19	<a href="http://www.maddox.com">www.maddox.com</a>
Propper Stopper	13	<a href="http://www.propperstopper.com">www.propperstopper.com</a>
Resa Power	IBC	<a href="http://www.resapower.com">www.resapower.com</a>
Rhino Switchboard Mats	7	<a href="http://www.rhinoswitchboardmats.com">www.rhinoswitchboardmats.com</a>
SP Products	3	<a href="http://www.spproducts.com">www.spproducts.com</a>
Working Concepts	22	<a href="http://www.safeworker.com">www.safeworker.com</a>

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