White Paper

How to move up the safety curve from basic clamps and cables on a budget

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Protecting workers and company assets from ignitions caused by static electricity can't be left to chance. In facilities where flammable and combustible products are processed, there's a very high probability that static electricity is generated by the movement of gases, liquids and solids. The risks of a fire or explosion caused by a discharge of static electricity in an EX/HAZLOC area are just too significant to ignore. To emphasise its significance static electricity is identified in North American and European legislation as a potential source of ignition in potentially flammable and combustible atmospheres.

Although static electricity is regarded as "witchcraft" by many people working in the hazardous process industries, static grounding and bonding protection methods are anything but complex. Industry guidelines like NFPA 77* and IEC 60079-32** identify specific processes susceptible to discharges of static electricity coupled with practices that can eliminate the threat of ignition.

The most effective and practical means of eliminating the threat of a fire or explosion caused by static electricity is to ensure static charges are not permitted to accumulate on equipment, vehicles and people. Grounding and bonding presents the most effective and reliable way of removing static electricity from an EX/HAZLOC atmosphere.

*NFPA 77: Recommended Practice on Static Electricity" (2014).

** IEC 60079-32, Part 1: "Explosive atmospheres – Part 32-1: Electrostatic hazards – Guidance" (2013).

NOTE: Cenelec CLC/TR 50404 "Electrostatics. Code of practice for the avoidance of hazards due to static electricity" (2003) has been superseded by CLC/TR: 60079-32-1"Explosive atmospheres – Part 32-1: Electrostatic hazards – Guidance" (2015).

Industry approved guidance on controlling static ignition hazards.

To ensure we are protected from ignitions caused by static electricity we need to follow some basic rules of engagement provided in publications like NFPA 77 and IEC 60079-32. The most important benchmark is to ensure we can achieve an electrical resistance of 10 ohms or less between electrically conductive plant equipment, including mobile plant, people and vehicles, and a "ground source" that is verified as a true earth grounding point. This point will have a low resistance connection to the general mass of the earth and will transmit electrostatic charge from equipment to the earth, regardless of how much static electricity is generated by the process. This, in turn, removes the static ignition risk from the processing location.

In order to achieve a safe level of protection from electrostatic ignitions we must provide an effective means of grounding the equipment. Historically, the grounding of portable objects like drums, vessels, and vehicles like trucks and railcars was achieved with basic clamps that were assumed to make a direct connection to the equipment.

Figure 1: Traditional plier type basic clamp.

However, issues like product build-up and protective coatings that can impede the integrity of grounding clamp connections, combined with rusted and degraded cable connections, prompted the industry to develop ground status indicator systems, particularly for the larger hazards which are typically reflected in railcar, truck and IBC bulk handling operations. Ground status indicators (commonly referred to as static grounding systems) monitor the connection to the equipment at risk of charge accumulation and provide a visual reference to workers to indicate if they have a secure ground connection, which, if green, will indicate that they can proceed with the process. In addition to providing a monitored grounding circuit many of these systems contain output contacts that can be interlocked with the process. Normally the grounding system's output contact will be interlocked with the equipment controlling the flow or processing of the product, thus ensuring the equipment is grounded before the process that generates static electricity can begin.

Figure 2: Traditional wall mounted ground status indicator system with internal output contacts. Note the green for 'SAFE TO GO' indication method.

Sourcing and specifying grounding solutions with the flexibility to meet your specific zoning, installation and operating requirements.

For somebody tasked with controlling static ignitions hazards, solutions tend to fall between basic clamps and cables and static grounding systems. Static grounding systems offer the most layers of control and protection over static ignitions risks, particularly as they can monitor the integrity of the connection to the process equipment, provide a visual indication to operators of a positive ground connection and shut down the process if the grounding connection is ever compromised.

Although the majority of solution specifiers would like to have multiple layers of protection over electrostatic ignition risks it can be difficult to source the budget for processes where many items require static grounding protection. In addition, the processes responsible for generating static electricity may be operated manually with no means of automating safe controls over the process. One example of this is facilities that carry out manual filling operations of large quantities of drums and smaller containers with flammable liquids.

Bond-Rites provide 2/3 the level of protection of static grounding system at half the cost.

The Bond-Rite® family of products enable product specifiers apply additional controls over electrostatic ignition hazards above and beyond basic clamps and cables, without the burden of justifying purchases associated with grounding systems with interlock capability. For 15 years Bond-Rites have enabled solution specifiers to move up the safety curve from basic clamps and cables to achieve enhanced levels of safety by providing workers with a visual means of verifying a solid electrical connection to equipment for the duration of the process.

Employing the well-recognised safety principles of GREEN for "SAFE TO GO", Bond-Rites utilise a pulsing green LED to indicate when the equipment (e.g. drum) has a resistance of 10 ohms or less to the site's verified ground network. All Bond-Rites continuously monitor the connection to the equipment until the clamp is removed. The green for "SAFE TO GO" concept is extremely easy for workers to engage with enabling them to take responsibility for their own safety and that of their colleagues.

Figure 3: Bond-Rites provide operators with 'SAFE TO GO' visual indicators.

The benefit for product specifiers and buyers, particularly for processes that cannot be interlocked, is that they can enhance the controls over "their" static ignition hazards to a much higher level than basic clamps without having to stretch their budget to the more established interlock-able static grounding systems. Compared to a traditional static grounding system a Bond-Rite can provide 2/3 of the level of protection at close to 1/2 of the cost.

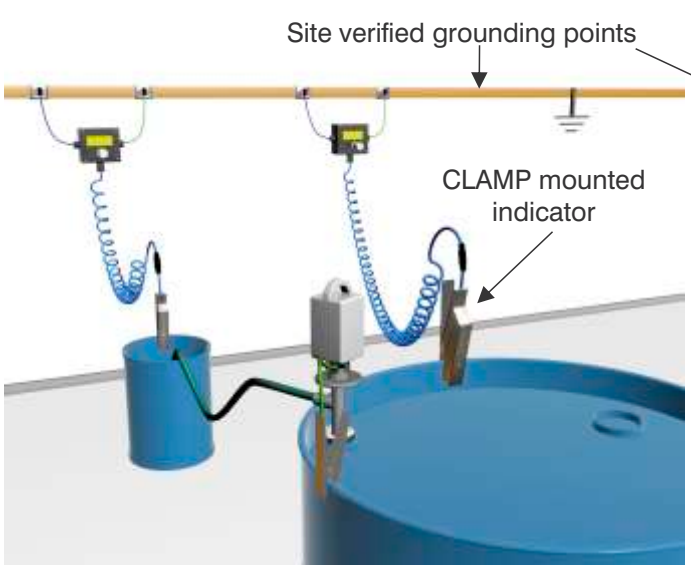
Taking an example of a typical drum filling operation, the normal mode of static grounding protection will be to ground the drum with a basic clamp and cable. Electrical isolators like paint coatings, product deposits and rust can prevent the clamp teeth from making a solid, reliable connection to the drum. Following repeated opening and closing cycles clamp springs can stiffen, losing their capability to close completely thereby reducing their capacity to make a reliable connection to equipment.

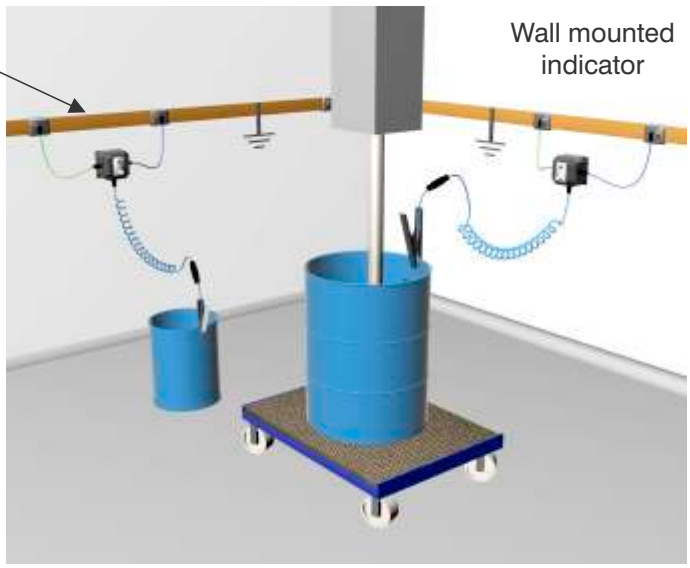
A Bond-Rite® CLAMP or Bond-Rite® REMOTE can provide workers with a visually verified ground connection to the site's grounding network. All workers need to do is clamp the drum and wait for the pulsing green LED to activate. As long as the green LED is pulsing, the operator can work safe in the knowledge that he/she has obtained a green light to start the process and the Bond-Rite® will continuously monitor the circuit ensuring static charge generated by the operation is transferred from the potentially explosive atmosphere.

Bond-Rites come in various configurations that complement the ignition control requirements of the product specifier, the installation flexibility desired by electrical installers and ease of engagement provided by the GREEN for "SAFE TO GO" principle for workers.

In compliance with NFPA 77 and IEC 60079-32, the Bond-Rite® CLAMP is ideal for applications where the operator can get an immediate visual verification of a secure 10 ohm, or less, connection to equipment at risk of accumulating electrostatic charges. If there's a chance that the product from the process could obscure the LED in the Bond-Rite® CLAMP (e.g. coatings mixing operation), the Bond-Rite® REMOTE can be specified. This configuration enables the LED and circuit electronics to be wall mounted which is more typical of a traditional ground status indicator station. Both of these versions are powered by a 9V battery which can easily be replaced as necessary.

If the site has processes that last for more than an average of 6 hours per day, product specifiers can specify the Bond-Rite® REMOTE EP. This EP power supply takes line / mains power (230 V AC or 115 V AC) and converts it into an intrinsically safe power source for each individual Bond-Rite® REMOTE indicator station. Not only can the Bond-Rite® REMOTE EP power supply be mounted in Zone 2/21 areas and Class I, II, III, Div. 2 locations, it can power up to 10 individual Bond-Rite® REMOTE indicator stations simultaneously. The Bond-Rite® CLAMP and Bond-Rite® REMOTE indicator stations can be mounted in ANY location that is classified as an EX/HAZLOC atmosphere.





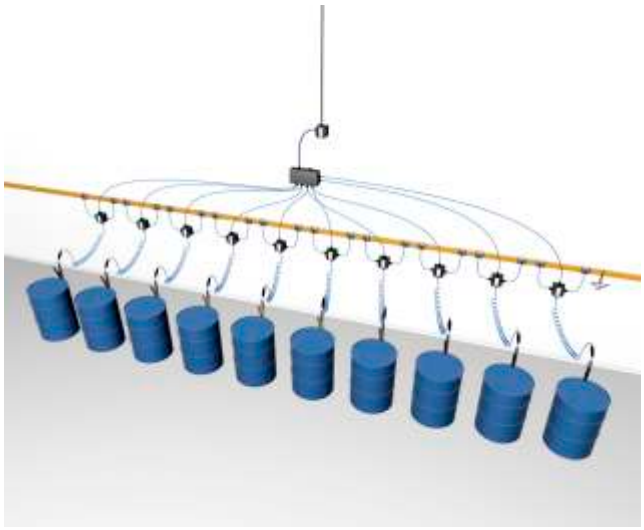


Figure 5: The Bond-Rite® REMOTE EP power supply can power up to 10 Bond-Rite® REMOTEs simultaneously.

The Bond-Rite® EZ is a portable device that bonds equipment to ensure they are at the same electrical potential or can be used to ground objects directly to a verified earth or via other objects that are connected to earth. The Bond-Rite® EZ consists of a Bond-Rite® CLAMP attached to standard or large stainless steel heavy duty clamp with 2 pole Cen-Stat™ cable.

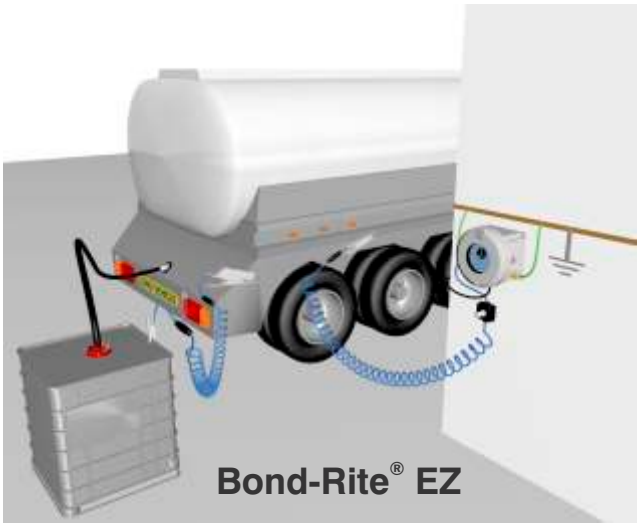


Figure 6: In this example the truck has a verified ground connection with the Earth-Rite® RTR static grounding system. The gravity fed metal IBC (tote) is grounded via the truck with the portable Bond-Rite® EZ.

Green for "SAFE TO GO" vs. RED for not safe to go.

Some equipment providers supply similar products that provide indication of a positive ground connection with no visual indicator. The only indication such devices provide workers with is a red LED to indicate a negative ground connection. On two counts it's worth noting that operators prefer a GREEN for "SAFE TO GO" mode of operation. Secondly, how does the operator know if the device is in fact grounding the equipment? It will be virtually impossible for the operator to know, during a process or manual handling operation, if the system is actually grounding the equipment or if the battery, that powers the red indicator when it is not connected to ground, has simply run out of power.

Summary

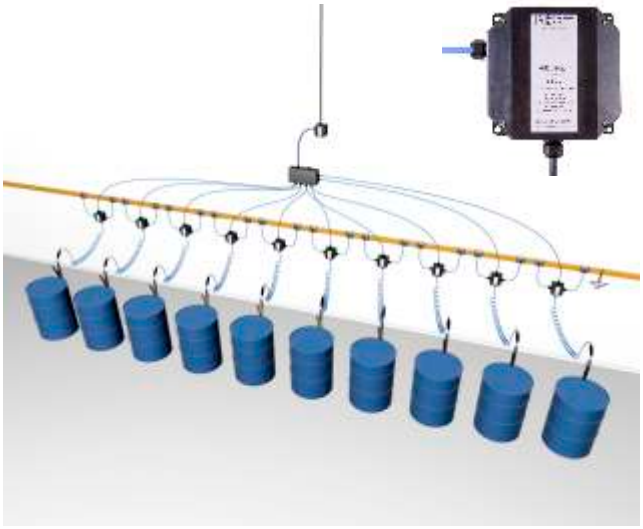
Now in its 15th year since its launch the Bond-Rite® family of grounding and bonding solutions provide product specifiers with a cost effective option that enhances the safety of processes at risk at discharging electrostatic parks. The range of installation and portable options provided by the flexibility of the Bond-Rite® means specifiers can virtually match the installation and operating requirements of everyday EX/HAZLOC operations. Most importantly the green for "SAFE TO GO" principle is the clearest message that workers can have to proceed with an operation or process that could be a static ignition risk.

Bond-Rite® CLAMP

- ✓ Patented static grounding clamp with green LED indicator and grounding circuit mounted in a rugged stainless steel clamp.
- ✓ Attention grabbing green LED pulses continuously indicating a continuous connection to ground.
- ✓ LED positioned in ideal position for operator to verify a good ground connection.
- ✓ Replaceable 9V battery.
- ✓ Simple installation.
- ✓ Can be operated in all EX and HAZLOC areas.

Bond-Rite® REMOTE

- ✓ Wall mounted indicator station with heavy duty stainless steel 2 pole standard and large sized grounding clamps.
- ✓ Ideal for processes (e.g. coatings mixing) where product has the potential to obscure the LED on the Bond-Rite® CLAMP.
- ✓ Attention grabbing green LED pulses continuously indicating a continuous connection to ground.
- ✓ Battery operated version can be installed and running in less than an hour.
- ✓ Replaceable 9V battery.
- ✓ Can be operated in all EX and HAZLOC areas.
- ✓ Indicator station available in static dissipative GRP and stainless steel.



Bond-Rite® REMOTE (EP)

- ✓ Wall mounted indicator station with heavy duty stainless steel 2 pole standard and large size grounding clamps.
- ✓ 230 V AC / 115 V AC power supply that can be mounted in Zone 2/22 and Class I, II, III / Div. 2 atmospheres.
- ✓ The EP version powers up to 10 individual indicator stations meaning 10 individual pieces of plant equipment can be grounded simultaneously.
- ✓ Attention grabbing green LEDs pulse continuously indicating a continuous connection to ground.
- ✓ Ideal for processes where the production process is intensive and equipment requires continuous ground verification for periods lasting longer than 6 hours per day.
- ✓ Can be operated in all EX and HAZLOC areas.
- ✓ Indicator station available in static dissipative GRP and stainless steel.

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Bond-Rite® EZ

- ✓ A portable bonding verification device consisting of a Bond-Rite® CLAMP attached to standard or large stainless steel heavy duty clamp with 2 pole Cen-Stat cable.
- ✓ Ideal for bonding portable equipment.
- ✓ Attention grabbing green LED pulses continuously indicating a continuous connection bond between portable equipment.
- ✓ Replaceable 9V battery.
- ✓ Can be operated in all EX and HAZLOC areas.

Two Pole Clamps and Cable

- ✓ FM / ATEX certified static grounding clamps compatible with all Bond-Rite® REMOTE and Bond-Rite® EZ.
- ✓ VESX90-IP large clamp ideal for connecting to large objects like railcars and IBCs.
- ✓ VESX45-IP standard clamp ideal for clamping onto 205 litre (1 gallon) drums and smaller containers.
- ✓ System of quick connects enable connection of different lengths of 2 pole Cen-Stat cable, supplied in standard lengths of 3m, 5m, 10m and 15m.

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