

Application Considerations When Specifying Air and Solid Dielectric Insulated Medium Voltage Switchgear

Application Considerations	Air Insulated Switchgear			Solid Dielectric		
Voltage, KV	17kV	27kV	N/A	15kV	29.3kV	38kV
Current, A	600A	600A	N/A	800A	800A	800A
BIL	95kV	125kV	N/A	95kV	125kV	150kV
Interrupting, Sym	Up to 14kA	Up to 14kA	N/A	16kA	12.5kA	12.5kA
AC Withstand	N/A	N/A	N/A	35kV	60kV	70kV
Maintenance	Air insulated switchgear manufacturers suggest performing visual inspections of switchgear every 5 years for proper performance. If barriers or switching mechanisms are misaligned and need adjustment the switchgear must be completely de-energized and grounded.			All components are encapsulated in epoxy molding. Trident® solid dielectric switchgear is 100% maintenance free by design.		
Safety	Live front air insulated switchgear exposes personnel to energized parts when the switchgear doors are opened and when switching operations and/or fuse replacement is performed. This can lead to direct exposure to live energized parts and increases the risk of exposure to arc flash from mis-operation or equipment failure.			Solid Dielectric insulated switchgear is 100% "dead front" meaning the switchgear is at zero ground potential. This design provides a high degree of safety and reliability by ensuring the operator will not come into contact with live energized parts. The SafeVu design features a true visible break without the use of insulating mediums such as oil or gas.		
Environment	Air insulated switching blades and contacts are susceptible to moisture, misalignment and excessive wear due to exposure to outside elements. Corrosion is common in coastal areas and tropical climates and this environment can further degrade the switchgear performance. Installation areas with a high degree of ground moisture can lead to degradation and failure of the switchgear.			Trident features a 304-stainless steel mechanism housing and epoxy encapsulated voltage and current sensors to stand up to the harshest environments. The mechanism housing is pressurized for submergibility to ensure failure free performance in environments that expose the switchgear to high moisture and high humidity.		
Operational reliability	Alignment of barriers and contacts must be in accordance with manufacturers suggested tolerances. Lubrication and adjustment of switching contacts is recommended over the life of the equipment to ensure proper performance. Typical air insulated designs are rated up to 400 full load operations.			Load break and fault interrupting mechanisms are installed in a fully sealed mechanism housing and do not require maintenance, lubrication or adjustment over the life of the equipment. These mechanisms are designed for 2,000 load break operations.		
Ingress of foreign objects	Air insulated switchgear is subject to damage and/or failure from the ingress of foreign objects such as birds, snakes, and rodents. These animals tend to prefer warm electrical connections which can result in flash-over and equipment failure.			Trident solid dielectric switchgear is fully dead-front, ensuring that all surfaces of the switchgear are at ground potential. Ingress of foreign objects will not cause a flash-over in the switchgear cabinet.		
Coastal Installations	In coastal climates, terminations, mechanisms and barriers exposed to atmospheric air can wear quickly due to corrosion and excessive moisture. When replacement is necessary the switchgear will need to be de-energized and grounded.			Solid Dielectric switchgear is engineered and manufactured to be submerged in the harshest environments. Coastal environments, sub-surface vaults, and areas susceptible to storm surge are ideal locations for the installation of Trident switchgear.		

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Flexibility	Air insulated switchgear utilizes traditional fusing for overcurrent protection which is limited to single phase trip. Three phase trip and reset are not available for this design. Operation of air insulated switchgear is primarily achieved by field personnel using hot sticks or other apparatus to close fuses into an energized bus. It is critical that only highly trained personnel perform fuse replacement on live switchgear.	G&W Electric switchgear provides the design flexibility of single-phase or three-phase resettable fault interrupting mechanisms. Several styles of self-powered overcurrent controls are available. The Trident is available as a spring operated mechanism, a motor actuated spring operated mechanism, or with a high speed magnetic actuator.
Renewal Cost - Barriers	Live high voltage terminations and surrounding surfaces are susceptible to corona discharge and tracking in air. Insulating barriers wear over time and should be inspected and replaced as a part of regular maintenance.	Does not apply. Solid dielectric insulated components within a welded stainless steel tank do not require barriers and are not susceptible to corona and tracking when proper pressure is maintained within the switchgear tank.
Renewal Cost – Fuses	Air insulated switchgear relies on fuses for fault interruption. It's critical to keep plenty of fuses in stock to quickly restore service in the event of a fault condition.	Solid dielectric switchgear utilizes resettable vacuum fault interrupters to safely and quickly clear faulted circuits. These vacuum interrupters do not need to be replaced over the life of the switchgear.
Automation Ready Design	Air insulated switchgear is traditionally operated with hot sticks. Retro-fit packages to fully automate existing air insulated switchgear are largely unavailable or require extensive modification and outages. Air insulation cannot be monitored remotely for foreign debris and moisture and therefore should only be operated after a visual inspection of the switchgear cabinet.	The G&W Electric Trident is designed to be fully automation ready without the need to change out the switchgear or modify existing switching mechanisms. Adding motors and automation controls is achieved with limited outage time required. This purposeful design allows for ultimate flexibility over the life of the equipment.

Additional Considerations

Failure Scenarios:

IEEE publications consistently rank moisture, dust and contaminants, and age as the main contributors to medium voltage switchgear failure. Fully sealed epoxy encapsulated switchgear eliminates moisture and contaminants and prolongs the life of your switchgear investment thus reducing the overall life cycle cost of your capital investment.

Installation:

The Trident and Trident with SafeVu will fit most existing air switchgear pads. As part of our design process, G&W Electric application engineers can provide you with 3D modeled layouts to ensure overall footprint and cable entry is compatible with existing site conditions.

Arc Flash:

Trident and Trident with SafeVu was designed with arc flash safety in mind. The fully dead front design prevents operators from being exposed to arc flash due to foreign objects coming into contact with energized parts. Pad mounted cabinet designs are available that allow for operation without exposure to source and tap elbow terminations. Consult with your G&W Electric application engineer for the many design options that will reduce arc flash exposure.

Fusing:

If a fuse is regularly exposed to overcurrent that is close to the operating range the heat and wear on the fusing element can degrade over time. G&W Electric's overcurrent protection uses digital fuse emulations which offer repeatable reliable performance and will improve coordination between devices.