



3M Science.
Applied to Life.™



**3M Wind Energy
Solutions**

Electrical Markets Division

About 3M Electrical Markets

3M has been proudly supporting the electrical industry for over seventy years with our innovative technology, solutions and service. Our primary products are used to bolster your electrical cabling network, including insulating, protecting, connecting, splicing, and terminating of power cables as well as a number of other applications.

Support from Start to Finish

Whether you are in the midst of a new project or maintaining operations, we are with you every step of the way. Maintaining your electrical power is critical, and the cost of downtime extreme.

What you get with us?

Trusted Products

Your reputation depends on reliability. That's why we're committed to providing you with proven, reliable electrical solutions.

Technical Salesforce

You need products that meet your specific requirements. Our technically trained salesforce will help you make an educated decision.

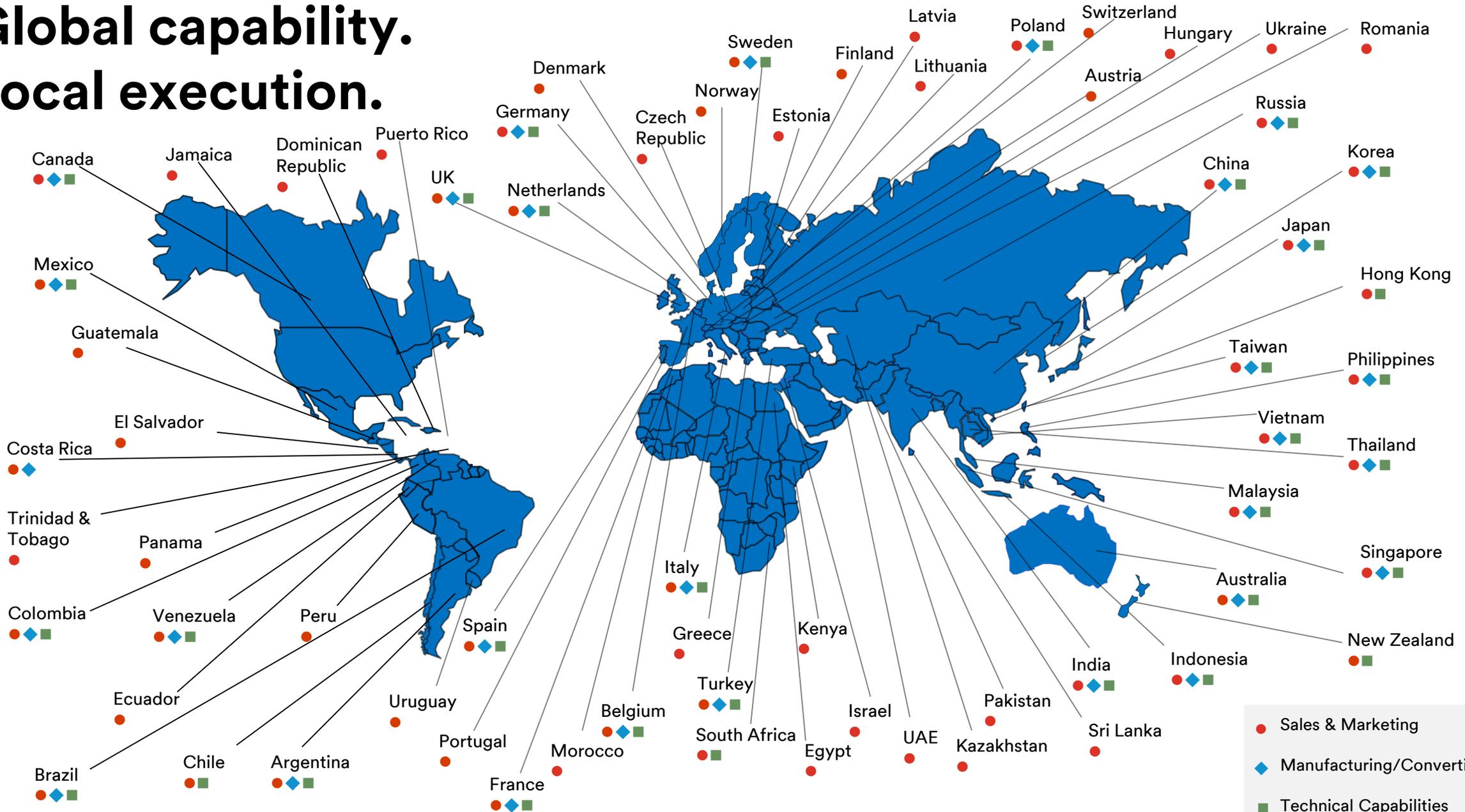
Hands-On Training

Our team of application engineers and sales specialists are available to tackle your challenges and assist with installation training.

70+ years of industry experience.
70 international subsidiaries.
Operations in 200+ countries.

Expert support where you need it.
When you need it.

Global capability. Local execution.



3M™ Wind Energy MRO Products Categories

A

Cable Accessories



B

Electrical Tapes & Supplies



C

Personal Safety & Asset Detection

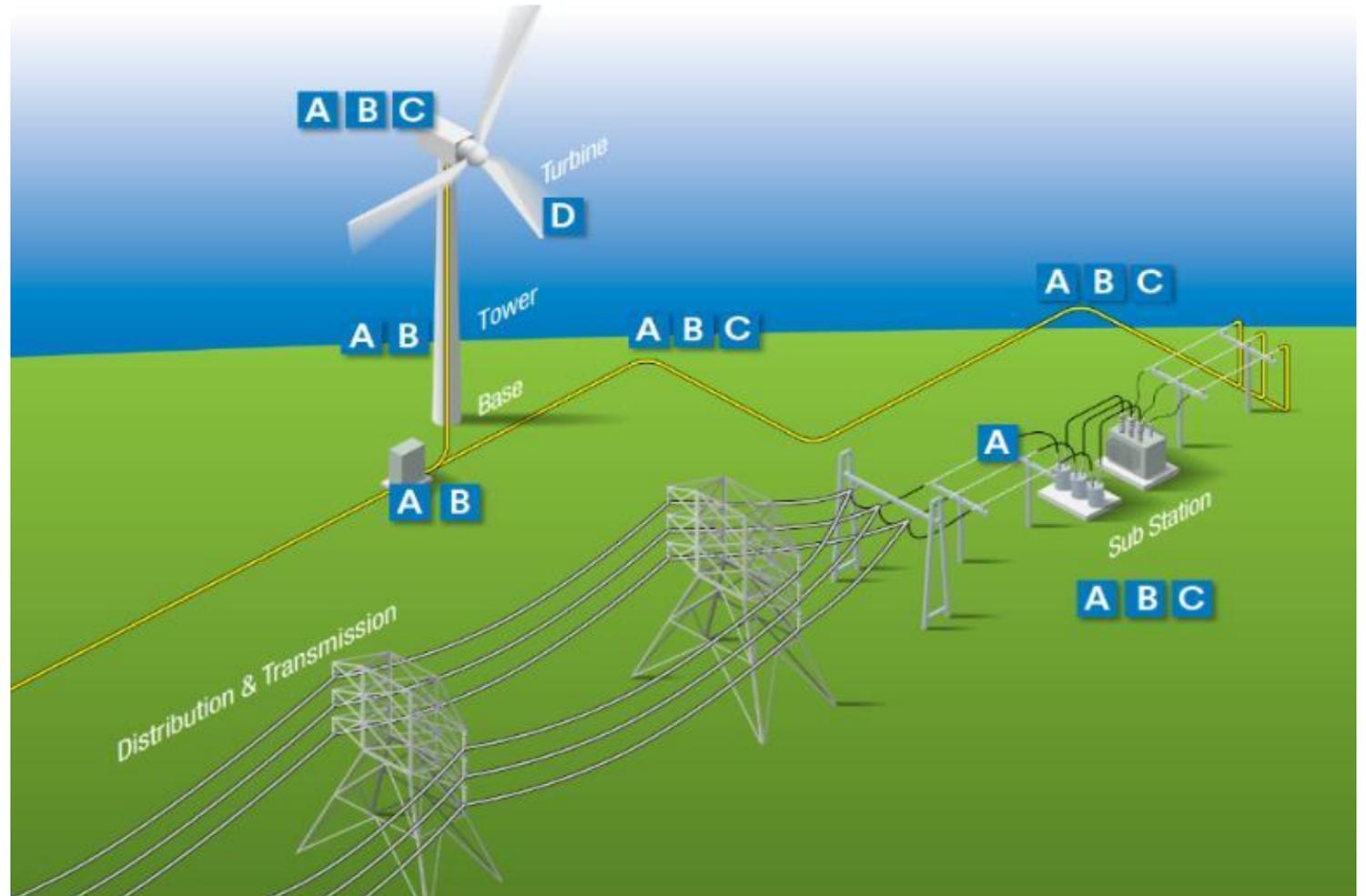


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Blade Protection Tapes & Coatings



Potential Locations on Wind Farm



Primary MRO Applications and Solutions

1 Terminate & Splice Cables



2 Cable End Seal & Jacket Repair



3 Splicing & Insulating of Low Voltage Cables



4 Gap & Cabinet Sealing



5 Tower & Nacelle Cable Abrasion Resistance



6 Cable Identification, Management & Protection



7 Worker Safety



8 Locating Underground Assets



9 Leading Edge Protection



What sets our products apart?

3M™ Cold Shrink Terminations and Splices

- Individually constructed for proven long-term reliability and safe operation at overload temperatures.
- Light weight and no torch or hot permit required.
- Offer reduced installation time vs. heat shrink, taping or resins.
- “Living Seal” meaning it expands and contracts with cable .
- Terminations include Hi-K capacitive stress control, which provides lower surface stress and improved track resistance. It is more reliable than geometric stress control offered by competitors. ([3M Study](#))

[Why Cold Shrink Technology? Video Here](#)

3M™ Electrical Tapes

- Global Leader and Inventor of Vinyl Electrical Tape.
- Field proven reliability with higher and lower operating temperatures*
- Vast portfolio of Vinyl, Rubber, Mastic, Specialty Tapes for numerous applications.

[3M™ Vinyl Electrical Tensile Strength. Video Here](#)

3M™ Wind Blade Protection Products

- Varying options for severity of damage
- Rain erosion and impact physics tested
- Designed with elastic properties, which allow the materials to absorb energy, thus mitigating erosion vs. hard tapes and alternative coatings.

Terminate and Splice Medium Voltage Cables

Use 3M Cold Shrink Technology and Separables for your installation and maintenance needs.



Application For MV Cable Termination & Splicing:

- 3M™ Cable Accessories are used in a variety of locations on a wind farm for safely terminating and splicing cables. These include:
 - Terminations at main and sub collection grids
 - Splices on cable string from collection grid to wind tower.
 - Terminations at each internal or external transformer cabinet located at an individual power generation tower.

QTIII / QT II Termination Kits



Separable Connectors



QS4 / QSIII Splice Kits



3M™ Termination & Splice Kits:

Please consult your 3M Sales Specialist for proper kitting recommendations

- 3M™ QTIII / QTII Termination Kits ($\leq 45\text{kV}$)
- 3M™ MV Separable 600 AMP 35kV T-Bodies
- 3M™ QS4 / QS3 Splicing Kits ($\leq 35\text{kV}$)
- 3M™ Cable Grounding Kits

Note: 3M offers both crimp and shearbolt lugs and connector options.

Repair Damaged Cable Jackets and Seal Cable Ends

3M offers fast and economical solutions to repair damaged cable jackets and seal cable ends.



Application of Cable Jacket Repair Tapes:

- Scotch® Professional Grade Tapes can be used to quickly repair cable jackets damaged during construction or operations without having to replace the cable. If there is damage beyond the cable jacket, 3M offers additional repair solutions.
- Locations Include MV Cable Runs between towers & collection grid and LV Cable used in Nacelle/Wind Tower and to Junction Box

Application of Sealing Cable Ends:

- For cable abandonment or cable storage, 3M offers cold shrink or heat shrink cable end caps protecting against corrosion.



Cable Jacket Repair & Replacement Products:

- Scotch® Linerless Rubber Splicing Tape 130C (Jacket Rebuild)
- Scotch® Outer Jacket Repair Tape 2234
- Scotch® Super 88 Heavy-Duty Grade Vinyl Electrical Tape (Secure the ends)

Cable End Sealing Products:

- 3M™ Cold Shrink Cable End Caps
- 3M™ Heat Shrink Cable End Caps



Splice and Connect Low Voltage ($\leq 2\text{kV}$) Cables

3M offers several options for effectively splicing and connecting low voltage cables for long term reliability.



Application of Low Voltage Connections:

- Low voltage cables are used to transmit power from the generator in the nacelle to the transformer cabinet at the base of the tower.
- Additionally, they are used for wind generation motors, heating, cooling, lighting, switches, etc.
- These cables can be quickly spliced or connected using 3M™ Cold Shrink Insulators, Lugs, Connectors, and Scotch® Professional Grade Tapes.

Low Voltage ($\leq 1\text{kV}$) Cable Connecting Products:

- [3M™ Cold Shrink Insulators 8420 Series](#) ($\leq 1\text{kV}$)
- [3M™ WF-100 SERIES Cold Shrink Sleeves](#) ($\leq 2\text{kV}$)
- [3M™ QI & QSLV-M Cold Shrink Insulators](#) ($\leq 1\text{kV}$)
- [3M™ Cold Shrink End Caps EC 1 – 5](#)
- [3M™ ITCSN Heavy Wall Heat Shrink](#) ($\leq 1\text{kV}$)
- [3M™ Termination Lugs and Barrell Connectors](#) ($\leq 35\text{kV}$)
- [Scotch® Super 33+™ Professional Grade Vinyl Electrical Tape](#) ($\leq 600\text{V}$)
- [3M™ Terminals](#)

Cold Shrink Insulators & Sleeves



Lugs & Connectors



Professional Vinyl



Seal Exposed Gaps and Protect from Erosion

3M mastics & water tight sealants offer fast and reliable protection from the elements.



Fire Barrier Sealants



Cabinets & Towers Base Sealing

- Protection of Transformer Cabinets as well as Tower Base & Nacelle Sealing Helps prevent corrosion & failures from moisture build up or animals.

Applicable Products

- 3M™ Fire Barrier Water Tight Sealants are easily applied, and highly reliable for long term prevention.
 - 3M™ Fire Barrier Water Tight Sealant 1000NS
 - 3M™ Fire Barrier Water Tight Sealant 1003SL
 - 3M™ Fire Barrier Water Tight Sealant 3000WT



Scotch® Cable Jacket Repair Tape 2234

Vinyl Mastic Tapes



Tower & Nacelle Gap Fill Application:

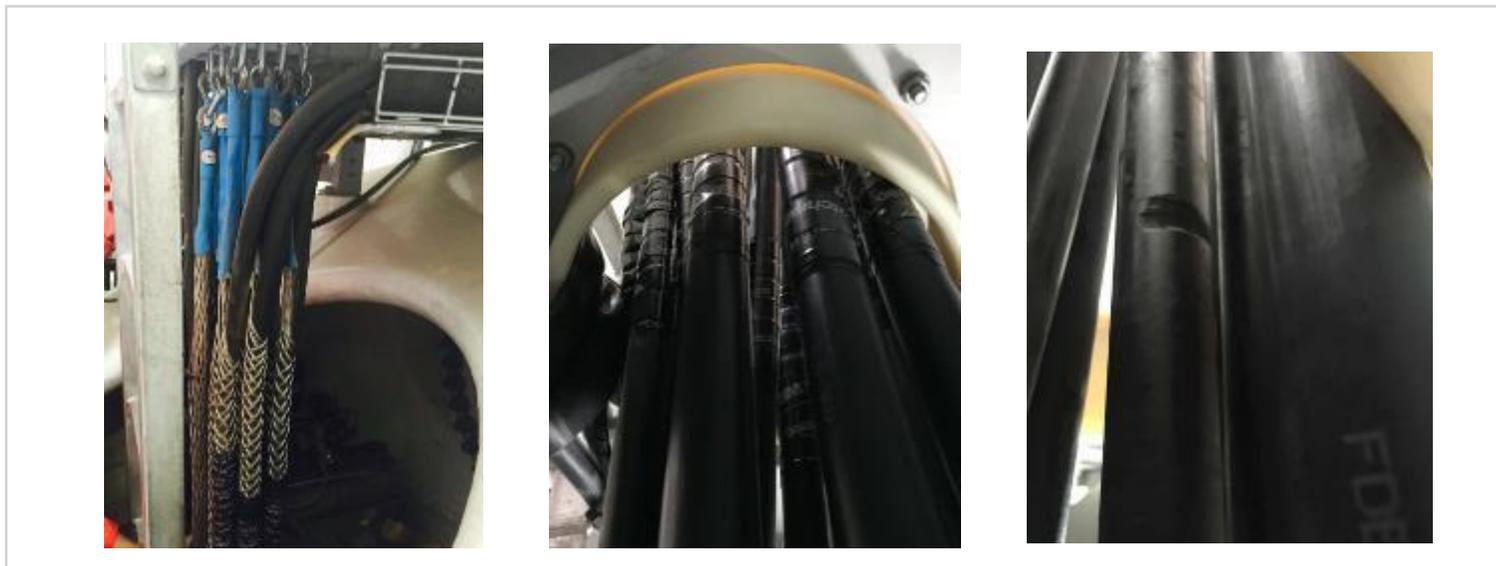
- Exposed to the Elements & Extreme Conditions, Wind Tower & Nacelle will experience erosion if not properly sealed.

Applicable Product:

- Scotch® Vinyl Mastic Roll 2210 Offers exceptional UV Resistance and Water Tight Sealing preventing corrosion.

Tower & Nacelle Cable Abrasion Protection

3M™ wear resistance tapes offer an fast and effective alternative to cable replacement.



Application of Abrasion Protection Tapes:

- During Operation, Internal Cables in Fan and Tower are Exposed to Vibration, Frequent Contact and Friction. This Leads to Cable Failure.
- Scotch® Cable Jacket Repair Tape 2234 and Scotchrap™ All-Weather Corrosion Protection Tape 51 provide excellent abrasion resistance and anti-wear protection to the cable.

Cable Wear Resistance Solutions:

- 3M™ Scotchrap™ All-Weather Corrosion Protection Tape 51 – Extra thick PVC for wear resistance.
- Scotch® Cable Jacket Repair Tape 2234
- Scotch® Super 88 Heavy-Duty Grade Vinyl Electrical Tape

Scotchrap™ Corrosion Tape



Abrasion Protection Tapes



Rubber Insulating Tapes



Worker Personal Protection

Employee safety is of absolute importance at a work site. At 3M our role is to support you with the right resources to help keep your workers safe and get the job done.

Head Protection



Securefit™ X5000



Fall Protection



DBI Sala Harness & Lifeline



Head Protection:

3M™ Hard Hat Protection Products

- 3M™ Securefit™ X5000 Hard Hats
- 3M™ Hard Hat H-700
- 3M™ Hard Hat H-800

Fall Protection:

3M™ Fall Protection Gear

Eye and Ear Protection



Securefit™ Glasses



E-A-Rsoft™ Plugs



Respiratory Protection



Disposable Respirator



Half & Full Face Protection



Recommended Products:

3M™ Eye Protection Products

- 3M™ Securefit™ Glasses
- 3M™ GoggleGear™ Goggles

3M™ Ear Protection Products

- 3M™ Earmuffs
- 3M™ Disposable Foam Ear Plugs

3M™ Respiratory Protection Products

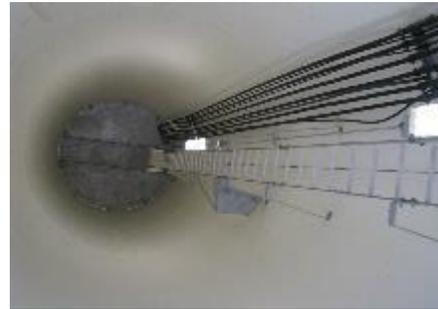


Cable Identification, Management, and Protection

Phase and Cable Identification



Secure and Organize Cables



Steel Barb Ties



Cable Identification Application:

Identify cables on cable string and in transformer cabinets. General Miscellaneous cable identification.

Cable Identification Products:

[Scotch® Vinyl Color Coding Electrical Tape 35](#)

[ScotchCode™ Wire Marking Tape Dispensers](#)

Cable Security & Organization:

[3M™ Steel Barb and Standard Nylon Cable Ties](#)

Application: Secure cables in tower & nacelle.

Protect Cables from Arcing and Fire



Fire Retardant Arc Tape



Application of Arc Proofing Tape:

Wrap Medium Voltage Cables in the Nacelle and Tower with Scotch® Fire-Retardant Electric Arc Proofing Tape 77 for additional protection of cables against fire.

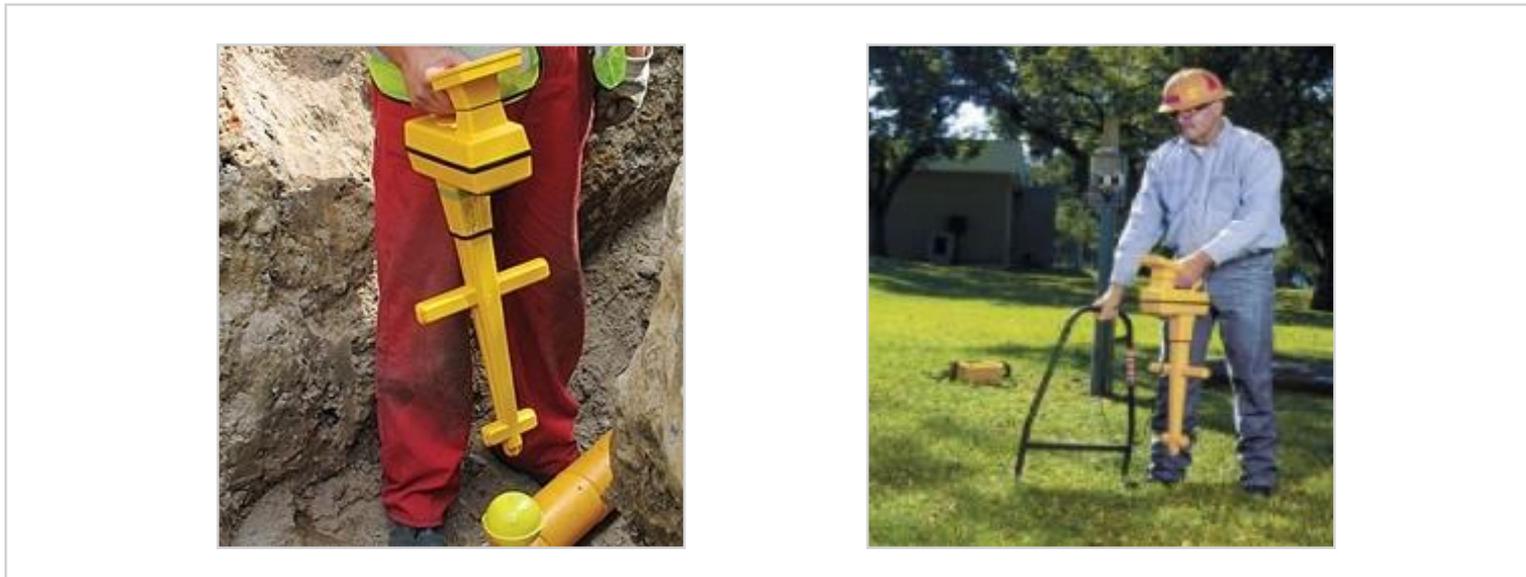
Recommended Product:

[Scotch® Fire-Retardant Electric Arc Proof Tape 77](#)

Fire Resistance up to 2000°F for three minutes

Locate Underground Assets

3M™ Locating & Marking System for easy detection of underground assets.



Application of Locating & Marking:

- The Electronic Marker System helps save time and money by enabling crews to quickly pinpoint the location of buried assets including cable runs, splices, vaults, road crossings, etc.

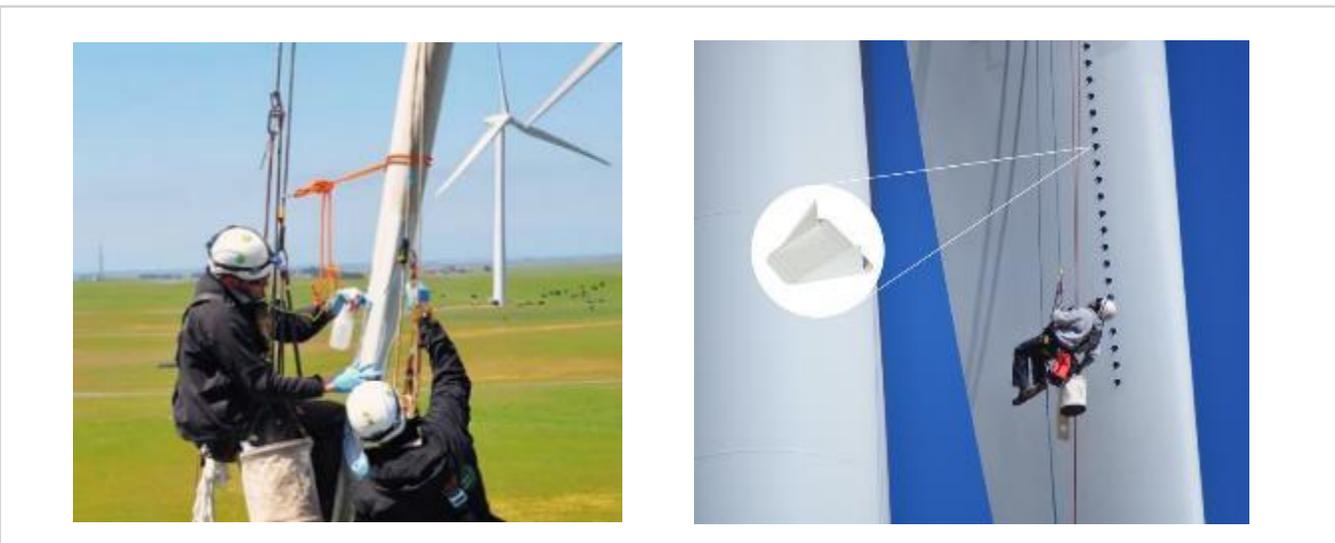
Locating and Marking Products:

- 3M™ Dynatel™ Locating Systems
- 3M™ Electronic Marker System
 - Markers: Near Surface, Mid-Range, Full Range (up to 8ft.)
 - Scotch® Detectable Buried Barricade Tapes



Wind Blade Protection and Efficiency Improvement

Repair and enhance the efficiency of blades damaged by the elements.



Wind Blade Repair & Efficiency Improvement:

- Through operation, wind blade leading edges are exposed to rain, snow, ice, sand and animal strike. These elements will erode and damage the leading edge of the wind blade, which in turn reduces energy efficiency.
- Using 3M™ Wind Blade Repair Tapes and Wind Blade Epoxy offers field installed preventative maintenance to keep the wind blade operational.
- 3M™ Vortex generators offer up to 3% energy production.

Products:

- [3M™ Wind Blade Protection Coating](#)
- [3M™ Wind Blade Protection Tapes](#)
- [3M™ Vortex Generator for Wind](#)

Blade Fillers and Coatings



Application Tools



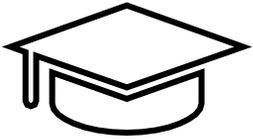
Blade Protection Tapes



Vortex Generators



Additional Resources



Energy Academy

Take expert-led, online electrical training anytime, anywhere 24x7.

[Sign Up Today](#)



3M Electrical App

View our full product portfolio, create shareable project lists, and more with our 3M Electrical App.

Available on:



[Learn More](#)

[Also visit us at 3M.com/Electrical](https://www.3m.com/Electrical)

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Important Notice

Before using any of these products, you must evaluate them and determine if they are suitable for your intended application. You assume all risks and liability associated with such use.

Warranty; Limited Remedy; Limited Liability.

3M's product warranty is stated in its Product Literature available upon request. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** If this product is defective within the warranty period stated above, your exclusive remedy shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product. **Except where prohibited by law, 3M will not be liable for any direct, indirect, special, incidental or consequential loss or damage arising from this 3M product, regardless of the legal theory asserted.**



Caution: Working around energized electrical systems may cause serious injury or death. Installation should be performed by personnel familiar with good safety practice in handling electrical equipment. De-energize and ground all electrical systems before installing product.