

SPECIFYING FOR SOLAR

A guide to specifying appropriate cable protection for photovoltaic installations



Atkore[™]
Flexicon

GROWING GREEN ENERGY DEMAND

Climate change is one of the greatest challenges facing the modern world. Due to this looming threat, there has been a renewed, global emphasis on moving away from fossil fuels in favour of renewable energy sources, such as solar power.

With this increasing focus on renewable energy has come increasing scrutiny. Specifically, large-scale photovoltaic (PV) installations are under pressure to generate green energy on an unprecedented scale. These installations, which are usually situated in remote or isolated locations and spread across large areas, require stringent maintenance routines and enhanced protection to ensure consistent performance.

As such, large quantities of cabling are necessary to guarantee uninterrupted power to equipment, which may be a substantial distance apart.

Yet despite cabling being vital to avoiding disruption, cable protection has traditionally been seen as an afterthought, with specifiers often choosing the lowest-cost option available.

This is a mistake – due to their external locations, solar PV installations are subject to a wide variety of hazards, with interconnected cabling typically experiencing prolonged exposure to ultraviolet (UV) radiation. Over time, these incorrectly-specified protection systems can become degraded or damaged, exposing necessary cabling and leading to potential failure.

The ensuing, unscheduled downtime caused by the breakdown of equipment and components such as photovoltaic inverters, can have widespread logistical, financial and performance-related consequences.

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HAZARDS AND CONSEQUENCES

In order to select appropriate systems that ensure ongoing performance, specifiers should consider carefully the range of environmental hazards to which cabling may be exposed.

For solar PV installations, any potential protective solution should be purpose-designed to withstand extreme temperatures and high UV radiation levels.

Temperature

Solar PV installations are subjected to higher temperatures by design. Heat exposure will also gradually break down the wiring's polymeric molecular chains, making the polymer stiffer, harder and more brittle.

This process occurs faster as the temperature rises, and can affect the cabling's flexibility and impact strength, resulting in impaired function. For sun-tracking solar panels where cabling and conduits are subjected to continuous movement, this impaired flexibility makes failure even more likely.

UV Radiation

Throughout the life of the installation, UV radiation will degrade plastic materials, including cable insulation and protective conduit. Failure could result in materials cracking, an increase in brittleness, less flexibility and lower impact strength.

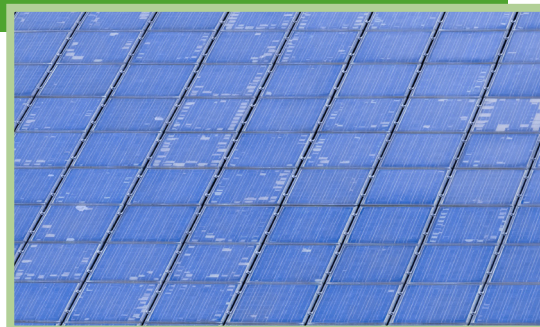
The levels of UV radiation can vary depending on geographical location and will determine the extent and severity of the potentially damaging effects. These levels vary throughout the world and could compromise cabling's ability to provide continuous power.

Physically finding faults and fixing damaged solar cabling caused by these hazards can be very difficult, especially across larger installations. Downtime results in lost revenue while remedial work is carried out, and contractors are under pressure to get systems back on line safely. If owners or operators are working from a payback deal, such disruption can often lead to penalty clauses being invoked.

Did you know?

Because temperature and UV damage changes the material properties and reduces fatigue life, compromised solutions may become more vulnerable to other environmental factors, including:

- Impact
- Crushing
- Corrosion
- Abrasion
- Dust and water ingress
- Attack from grazing animals and vermin



SPECIFICATION AND TESTING

Taking the hazards into account, it is recommended that cabling used in solar applications be protected in a flexible conduit system with excellent UV performance. This will enhance the level of performance over the installation's lifetime.

Yet while many flexible conduit manufacturers quote their products as 'UV resistant,' specifiers should

be wary that no recognised standard for UV resistance actually exists. Indeed, actual product performance claims can differ drastically from manufacturer to manufacturer – some cable protection systems claiming to offer UV resistance may only offer protection against occasional UV. Such systems would obviously be insufficient for solar PV installation applications, and begs the following question:

How do you know how much UV resistance a product will offer?

Selected Flexicon products are subjected to the 1000-hour Xenon arc test UL 1660, carried out by the independent Underwriters Laboratories. These products are then exposed to further, extended testing, developed for the world's most demanding environments.

During this extensive testing and performance simulation, Flexicon products have endured over 21,000 hours of Xenon arc testing without failure

To put this into context, this testing is equivalent to being subjected to over 21 years in Florida sunshine where UV radiation levels measure between 160 and 180 Kilo langleys. Such thorough quality control shows why Flexicon products have provided cable protection against UV radiation for applications in the Australian telecommunications industry for over 10 years, without failure.

21,000 HOURS of Xenon arc testing = 21 YEARS of sunshine = maximum market-leading protection



Did you know?

Flexicon can provide full technical advice for an installation either on site or by phone. The company also offers 'Flexiapp,' a specialist smartphone app and online product selector to help contractors make the right product selection based on answers to simple questions.



FLEXICON SOLAR WARRANTY

Flexicon is so confident in its range of solar flexible conduit systems' ability to survive external applications that it now offers varying warranty periods up to 20 years for specific product ranges, from the product's purchase date.

Designed to protect cables used for solar PV installations, this Solar Product Range Warranty offers reassurance that Flexicon's flexible conduit systems will not suffer from significant mechanical deterioration from UV exposure for either 20 years or 10 years depending on the product, as listed below:

20 Years

- **FPIH** – Heavy weight nylon (PA12) corrugated flexible conduit. Colour black.
- **FPIHR** – Heavy weight nylon (PA12) corrugated flexible conduit – highly flame retardant. Colour black.
- **FPIHSS/FPIHRSS** – Heavy weight, corrugated nylon (PA12), with stainless steel (316) overbraid.
- **FPISS** – Standard weight, corrugated nylon (PA12), with stainless steel (316) overbraid.
- **SSU** – Stainless steel (grade 316), helically wound, flexible conduit. Colour stainless steel, self-colour.

10 Years

- **FPAS** – Standard weight, flame retardant nylon (PA6) corrugated flexible conduit. Colour black.
- **FPI** – Standard weight nylon (PA12) corrugated flexible conduit. Colour black.
- **FPR** – Standard weight nylon (highly flame retardant PA6) corrugated flexible conduit. Colour black.
- **FPAH** – Heavy weight, flame retardant, nylon (PA6) corrugated flexible conduit. Colour black.
- **LTP** – Liquid tight galvanised steel, helically wound, flexible conduit with smooth oil resistant and high temperature pvc cover. Colour black.

Under the terms of the Solar Offer, where there has been significant degradation of the conduit's mechanical properties caused by ultraviolet radiation, Flexicon will replace the flexible conduit free of charge (see terms and conditions).

ENHANCED BENEFITS

There are a range of other properties that could enhance installation reliability and longevity further still, so make sure you discuss the following areas with your supplier:

- 1. Installation**
 It is important to ensure that cables have been installed and routed properly, to minimise the risk of damage further still.
 Make sure your conduit supplier advises you on the most efficient installation techniques that will reduce time on the job and provide the superior protection you require.
- 2. Cable security**
 Flexible conduit will also enhance the security of your cabling, protecting against both external damage and minimising the risk of theft. Speak to your supplier about the range of cable management solutions it can provide to interconnect circuits and wiring assemblies.
 For example, does your supplier offer a weatherproof connection box which can withstand extremes of heat, UV radiation and ingress protection? Are there tamper proof options to protect the cable system integrity for remote or unmanned installations?
- 3. Circuit identification**
 It is critical to be able to identify wiring safely and efficiently.

On the job



The customer
19MW solar farm in Australia



The problem
Incorrect specification of a PVC corrugated cable protection system, which failed within three months of installation and left cables exposed to the elements



The solution
Flexicon FPAS nylon corrugated system



The benefit
Robust and reliable solution, with fast installation and zero downtime

To find out more about how you can protect your electrical installation from the effects of UV radiation, contact 01675 466900



The customer
Kingsley Community School, Liverpool, UK



The problem
Protection for a 24kW photovoltaic system, which will generate over £80,000 income over the 20-year lifespan



The solution
Flexicon's FPAS non-metallic conduit to protect the cabling on the roof. Provides UV resistance and compression strength and when used with the FPA fitting has an IP rating of IP66. The conduit was used with the company's FPA T-pieces, allowing cables to branch off to connect to the individual photovoltaic strings.



The benefit
Superior protection from UV light, ingress from water and dust, ensuring the school achieves excellent payback.



Allied Tube & Conduit ▴ AFC Cable Systems ▴ Heritage Plastics ▴ Unistrut
Unistrut Construction ▴ Cope ▴ US Tray ▴ Calbrite ▴ Calbond ▴ Kaf-Tech
Columbia-MBF ▴ Eastern Wire + Conduit ▴ ACS/Uni-Fab ▴ Cii
Power-Strut ▴ Calconduit ▴ Razor Ribbon ▴ Calpipe Security
Vergokan ▴ Flexicon ▴ Marco

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