Polycarbonate and Protection from UV Radiation

The use of polycarbonate sheets for roofing has almost become synonymous with protection from UV radiation. But what does this protection really mean? And what is the protection good for? At Palram we understand the importance of these questions.
What is ultraviolet radiation?

UV or ultraviolet radiation is part of the electromagnetic spectrum, ranging from 10 to 400 nanometers, meaning that its waves are shorter than visible light, which we can see with our eyes, and longer than X rays.

About 10% of the radiation generated by the sun is UV. Thankfully, the shorter and most hazardous UV waves are absorbed by the atmosphere. At ground level, earth receives the range of 280-400 nanometers, which can be further divided to the higher UVA and lower UVB ranges. UV is well known for its harmful effects on the skin tissue which can increase the risk of cancer. Melanoma, the deadliest form of skin cancer, has been shown to correlate with the degree of UV exposure. UV exposure can also result in premature aging of the skin including wrinkling, freckling, dryness and roughness. Eye exposure has been associated with cornea damage and might lead to cataract formation. In addition, UV has a degrading effect on other organic and non-organic materials, which you can notice if you leave household items exposed to the sun for extended periods of time. Painted items would lose some of their color and some materials could crack or even disintegrate over time when exposed to the sun. On the beneficial side, UV radiation is responsible for the formation of Vitamin D in our bodies.

![Figure 1: The solar spectrum as measured at sea level](image-url)
Does polycarbonate block UV radiation?

Polycarbonate as a material blocks almost the entire relevant UV spectrum, meaning both UVA and UVB. The material absorbs UV radiation and does not allow it to be transmitted through. Even a very thin sheet of polycarbonate would absorb UV rays, and would provide far better protection to the skin and eyes than any sun protection cream. At the same time, polycarbonate transmits the visible light, which is the part of the spectrum that allows us to see colors. The visible light is higher on the spectrum, between 400 and 750 nanometers. The UV blocking characteristic made polycarbonate a popular choice for roofing in both commercial and residential construction. A great example is a swimming pool covered with a polycarbonate roof – bathers enjoy the natural light, which is transmitted, and they do not need to worry about UV radiation which is completely blocked.

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The UV blocking characteristic is a clear advantage of polycarbonate over other glazing materials such as glass, acrylic and fiberglass. While polycarbonate in its natural form blocks UV, other materials have to be specifically treated for UV blocking.
Should polycarbonate itself be UV protected?

If polycarbonate sheets do not transmit UV radiation and protect the people underneath, what is the importance of UV protected sheets? To answer this question, we need to remember that polycarbonate blocks UV by absorbing it. This absorption of harmful radiation would lead to yellowing or discoloration of the material over time, and eventually polycarbonate would lose its properties and break. Therefore, the UV protection declared by polycarbonate manufacturers is intended to protect the polycarbonate itself and not the people underneath.

Reputable polycarbonate manufacturers apply a very thin UV protective layer to the sheets. This layer is invisible to the naked eye and does not impact the physical and optical characteristics of the material. But it does secure the performance of the sheet throughout its lifetime, even under harsh sunlight exposure conditions such as those found in the Southwestern part of the United States, most of Australia, and the Middle East. A UV protection layer can be applied either on one side of the sheet or on both sides. When installed on the roof, one side protection is usually enough. The installer needs to pay attention and install the protected side of the sheet towards the sky.

In Palram’s lab, we test our polycarbonate sheets in a facility that simulates prolonged exposure to UV, called Accelerated Weathering Tester. This facility allows us to evaluate the future performance of our products when installed in different parts of the world, and to develop the appropriate level of coating for each application.
Summary

When talking about polycarbonate and protection from ultraviolet radiation, we must consider two separate types of protection. The first protection is for the people and objects under a polycarbonate roof. Any polycarbonate sheet, regardless of its shape, thickness or color, provides this protection from harmful UV. It is a great benefit of polycarbonate over other translucent materials. The second protection is for the sheet itself, in order to maintain its benefits and characteristics over time. Reputable sheet manufacturers provide this protection by applying a protective layer or layers on the sheet, as part of the manufacturing process. Whenever installing the sheets outdoors, you must request high quality UV protection for the sheets.