



Quick Links



Drawing on decades of weathering leadership and expertise, the Atlas Consulting Group provides in-depth consulting services that assist you in developing and applying the best weathering test methods and strategies for your products. **Atlas Weathering Consulting Insights** offers interesting and valuable information on a variety of topics relevant to long-term durability testing.

Downsizing Complex Products to Facilitate Earlier Testing

In recent years, Atlas has encountered greater customer interest in evaluating the long-term durability of multi-layered products often consisting of many layers of highly dissimilar materials. Examples of these types of products include LED screens, photovoltaic (PV) modules, wind turbine blades, armor plates, ballistic glazing, aircraft and automotive body panels, building construction panels and furniture parts. Most of these products have one thing in common; they tend to be large in size.

Developing tests to evaluate these kinds of structures has proven to be challenging. Because most testing standards are designed to address the individual components/materials, and not the entire product, they only help us to understand the individual stress sensitivities, and not those of the whole product. Creating accelerated weathering tests for full scale versions of products during the developmental stage has proven much too expensive to undertake, whereas real time tests in controlled environments, although far less costly, are too time consuming for evaluation of materials that are required to last for 10 or 20+ years.

Consequently, we have found that, for many constructions, one can create relatively small versions of the product and still conduct relevant evaluations in multiples, rather than on a single large specimen, allowing for reasonable statistical analysis. Cutting small samples from larger structures can be useful, but is not always a good idea, because of the amount of edge damage involved, or other lamination disruption that can occur.

A good example of using a mini version of a product stems from Atlas' extensive involvement in evaluating PV modules. Instead of evaluating a module consisting of typically 96 cells with dimensions of 1 X 2 meters, manufacturers have constructed fully functional mini-modules with dimensions of 125 X 125 mm, the size of a typical single crystalline silicon cell (Fig 1). Such mini-modules can then be evaluated in accelerated tests using standard laboratory equipment, and have proven to be adequate representations of their full -scale models, providing comparable weathering testing results.



Figure 1

Cautions when utilizing a mini sample approach

There are, of course, limitations to this mini sampling approach. One must always take into account the scaling effects of large dimensions when considering both thermal and moisture changes. For example, differences in thermal expansion coefficients may not have a considerable impact on a small sample; whereas, they can cause significant functional failures in a large piece.

When decreasing the product size, the ratio of different degradation pathways may change. However, with appropriate weathering testing strategies and programs, the risk of deviation and misinterpretation of test results can be minimized.

Developing a new product?

Consider creating a mini sample of your product early on in the development process and utilizing it in a test program designed specifically for you. Not only will it allow you to potentially decrease your product development time and costs, but it can also help identify possible issues at an earlier stage of product development. The Atlas Consulting Group is a team of experts from different fields who are happy to support you in creating appropriate programs for testing with downsized products.

For more information contact the Atlas Consulting Group at atlas.info@ametek.com (US) or atlas.info@ametek.de (Europe).

