



Q-Lab Weathering Research Service

Florida • Arizona • Natural • Accelerated

The Most Trusted Name In Weathering



Will Your Products Last?

Sunlight, heat and moisture can cause serious product deterioration – such as color change, cracking, peeling, oxidation, or loss of strength. Damage from weathering or corrosion occurs both outdoors and indoors, and its severity can vary greatly in different climates. Even materials that are resistant to sunlight alone or to moisture alone often fail when exposed to sunlight and moisture in combination. Do you know how well your products will last in every location where they are used?

Don't Guess When You Can Test

Reliable weathering and corrosion data can help you avoid unexpected product failures. Testing can increase your profitability when used for selecting new or less expensive materials, improving existing materials, and evaluating how changes in formulations affect product durability.

Natural outdoor weathering and corrosion testing gives the most realistic prediction of product performance, with a longer test duration. Accelerated outdoor testing and accelerated laboratory testing give faster results. Many companies use both natural and accelerated testing in order to compare the data and ensure the reliability of the test program.

Weathering & Corrosion Testing



Q-Lab offers standard testing service packages for the automotive, building products, coatings and finishes, plastics, textile and other industries. You may design your own test, or work with us to develop a custom test.



Q-Lab Weathering Research Service

Q-Lab Weathering Research Service provides internationally recognized outdoor and laboratory weathering and corrosion test services in Florida and Arizona. In addition, Q-Lab offers visual and instrument evaluations, as well as offering custom test program design and special project development.

Experienced and reliable

Q-Lab provides the highest quality contract weathering testing services. Our natural weathering site opened in 1959. Today, our scientists, engineers and technicians participate in ASTM, ISO and other professional organizations in creating standard test methods and procedures.

Instant credibility

When Q-Lab does your testing, the results have instant credibility with your customers and colleagues. Q-Lab conducts all exposure tests and evaluations in accordance with appropriate test methods from ASTM, ISO, BSI, DIN, JIS, SAE, and other recognized organizations.

Low cost

Q-Lab's state-of-the-art exposure and material evaluation services are available at a surprisingly affordable price.





Outdoor testing benchmarks

Material scientists often use “Florida Weathering” or “Arizona Weathering” as international benchmarks for material weatherability testing. For a complete outdoor testing program, many companies test their products in both Florida and Arizona.

Q-Lab Florida

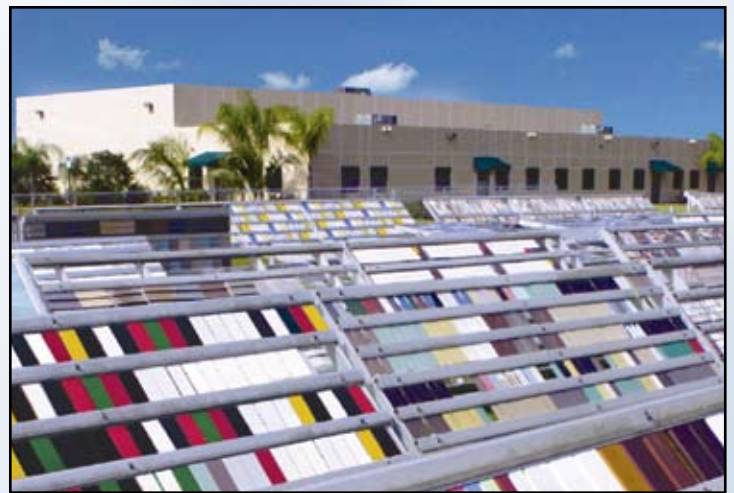
Subtropical Exposures

Q-Lab’s Florida exposure site is located south of Miami on the southern tip of Florida, in the only true subtropical region in the continental United States.

This site has high-intensity sunlight, high annual UV, high year-around temperatures, abundant rainfall, and very high humidity. When combined, these factors create the harsh climate that makes Miami the ideal location for testing exterior durability.

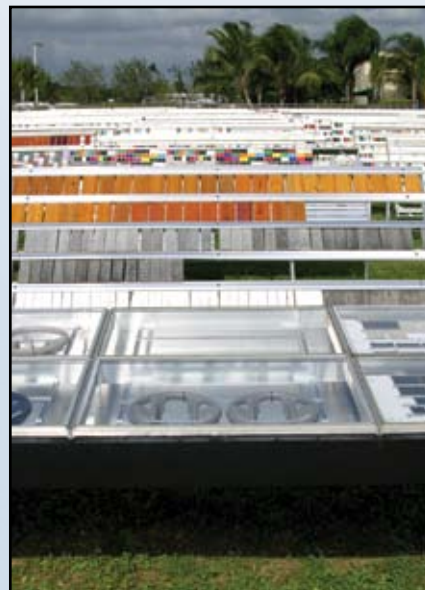
This moist, humid climate has been proven especially useful for certain types of testing:

- Moisture sensitivity of products like coatings, building materials, and some plastics
- Mildew resistance
- Corrosion testing

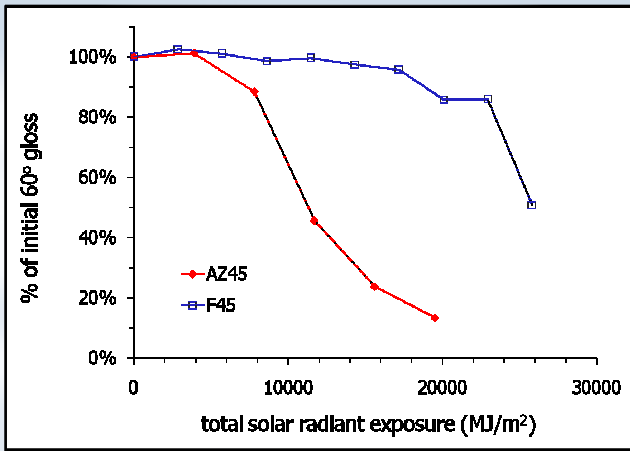


Q-Lab’s Florida site is the southernmost commercial exposure location in the United States.

| Florida Site Climate Profile | | | | |
|------------------------------------|-----------------------|-------------------------|---------------|------|
| Latitude | Longitude | Elevation | | |
| 25° 27' North | 80° 20' West | 7.0 feet | | |
| Typical Annual Solar Energy | TUV | Total | %Sun | |
| Direct, 25° South (latitude angle) | 280 MJ/m ² | 6,588 MJ/m ² | 69% | |
| Temperature (Air) | C | F | | |
| Average Summer Maximum | 32°C | 90°F | | |
| Annual Average Maximum | 28°C | 82°F | | |
| Annual Average Minimum | 21°C | 70°F | | |
| Average | 24°C | 76°F | | |
| Average Humidity | Rainfall | mm | inches | |
| Summer Max. | 93% RH | Monthly Max. | 237 | 9.5 |
| Maximum | 80% RH | Monthly Min. | 46 | 1.8 |
| Minimum | 61% RH | Monthly Avg. | 152 | 6.1 |
| Annual | 70% RH | Total/Year | 1420 | 56.8 |
| | | Rain Days/Year: | 111 | |



Florida subtropical exposures subject test specimens to wet, humid conditions. Many architectural and automotive materials are tested here.



Outdoor testing in multiple locations is important because there may be significant differences in environmental stresses. Shown here are Arizona and Florida exposures of a vinyl acrylic polymer.



Q-Lab's Arizona site is 30 miles from Phoenix in an area away from automotive, industrial or agricultural pollution.

Q-Lab Arizona

Desert Sunshine Exposures

Arizona is a benchmark location for outdoor durability tests because of its high-intensity sunlight and high year-around temperatures.

Compared with Florida, the Arizona test site offers about 20% more sunlight, higher annual temperatures, and lower humidity. During the summer, the air temperature may reach 115°F (46°C) and a black body sensor may reach over 160°F (71°C).

This extreme climate has been proven useful for certain types of testing and materials:

- Color and gloss of coatings
- Color stability, heat aging, and physical properties of plastics
- Coatings on plastics
- Lightfastness and tensile strength of textiles

Arizona desert exposures are ideal for testing materials under very hot, dry conditions.



Arizona Site Climate Profile

| Latitude | Longitude | Elevation | | | |
|------------------------------------|---------------|-----------------------|-------------------------|------|--------|
| 33° 23' North | 112° 35' West | 1055 feet | | | |
| Typical Annual Solar Energy | | TUV | Total | %Sun | |
| Direct, 33° South (latitude angle) | | 334 MJ/m ² | 8,004 MJ/m ² | 85% | |
| Temperature (Air) | | C | F | | |
| Average Summer Maximum | | 40°C | 105°F | | |
| Annual Average Maximum | | 30°C | 86°F | | |
| Annual Average Minimum | | 13°C | 56°F | | |
| Average | | 21°C | 70°F | | |
| Average Humidity | | Rainfall | | mm | inches |
| Summer Max. | 28% RH | Monthly Max. | 28 | 1.1 | |
| Maximum | 49% RH | Monthly Min. | 2 | 0.1 | |
| Minimum | 21% RH | Monthly Avg. | 16 | 0.6 | |
| Annual | 35% RH | Total/Year | 186 | 7.4 | |
| | | Rain Days/Year: | 32 | | |



Automotive Products



Building Materials



Paint & Coatings



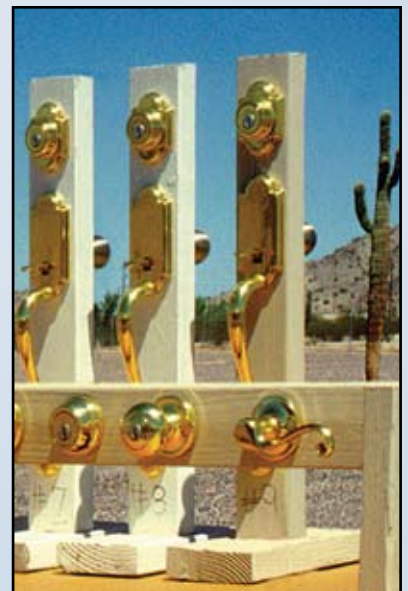
Plastics

Will Your Products Last Outdoors?

Products designed for outdoor use should be tested in Florida and/or Arizona before being entered into the marketplace. Test specimens can be almost any material or shape including painted panels, building materials, textiles, plastics, metal parts, or complex assemblies. Q-Lab has nearly 50 years of experience in evaluating the durability of a wide array of outdoor products, from the simplest child's toy to sophisticated automotive components.



Exposure tests are performed on test panels and on actual parts. Test methods and the size, shape and material of specimens determine which type of direct exposure testing is right for your products.



Natural Outdoor Weathering

- * **Most Realistic Results**
- * **Inexpensive and Reliable**

Various specimen mounting and exposure techniques are available for natural outdoor exposure testing.

Direct Exposure. Direct exposures are used to test many exterior-use materials, such as industrial coatings. Specimens are securely mounted with their front surface facing the sun. Different exposure angles and mounting methods are used for different applications.

Under Glass. These exposures are used to test interior-use materials, such as textiles and printing inks. Specimens are under 3 mm window glass to filter out short-wave UV. Exposures are typically at 45°.

Black Box. Tests reproduce conditions found on the trunk or hood surfaces of a vehicle, including higher temperatures and wet times. Under glass black box exposures are used to test interior automotive materials.

AIM (Automotive Interior Materials) Box. These under glass exposures simulate the environment inside an automobile and are suitable for mounting larger components like dashboards. Some AIM boxes feature solar tracking.

Salt-Accelerated Outdoor Corrosion. Direct exposures with salt spray can produce fast and realistic corrosion, particularly for coated metals.

Mildew Tests. In this Florida exposure, panels are typically positioned at a 90° north to reduce sunlight, decrease surface temperatures, and increase moisture. In addition, specimens may be placed near or under vegetation to promote growth.

The specimen mounting technique and exposure angle have a significant effect on solar energy dosage, specimen temperature, and time of wetness. For a full description please request LL-9025, *Outdoor Weathering: Basic Exposure Procedures*, or contact Q-Lab to discuss which option is suitable for your test program.

Florida & Arizona Weathering Test Methods*

- Direct & Under Glass Exposures (ASTM G7, G24, D1435)
- Black Box (ASTM D4141; GM 9163P)
- AIM Box (GM 9538P, 7455M, 7454M, 3619M; GMW 3417)

Outdoor Corrosion Exposure Test Methods*

- Natural Atmospheric (ASTM G50)
- Salt Accelerated - SCAB (ASTM D6675)

*Contact Q-Lab Weathering Research Service for a complete list



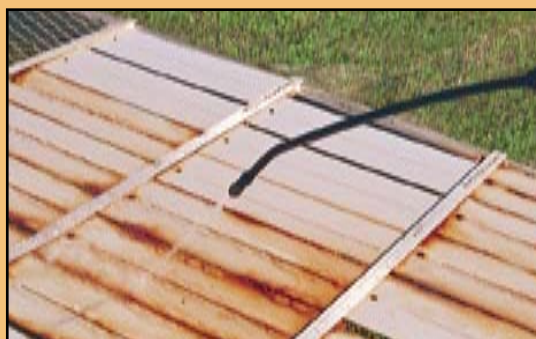
Sub-frames with window glass protect interior materials tested in “under glass” exposures at Q-Lab Arizona.



High temperatures are a major factor in Florida exposure tests. Using a black box increases the temperature of the specimens even more.



These AIM Boxes in Arizona are used to test materials for automotive interiors. They can hold large, 3-D parts like instrument panels.



Specimens in salt accelerated corrosion tests are sprayed with a salt solution twice per week.

Accelerated Outdoor Weathering

- * **Faster Test Results**
- * **Full Spectrum Natural Sunlight**

Sometimes you can't wait for months or years to find out how well your products will perform outdoors. If you need faster answers, but don't want to use artificial laboratory devices that only simulate sunlight, the Q-Trac Natural Sunlight Concentrator may be the answer. It gives quick, realistic results with natural sunlight as the light source.

The Q-Trac is an accelerated outdoor weathering tester that uses a series of 10 mirrors to reflect and concentrate full spectrum sunlight onto test specimens. Rotating on its base, it automatically tracks the sun throughout the day. This solar concentrating system maximizes the amount of sunlight exposure that your test specimen receives.

The Q-Trac also has a water spray system that can be programmed to perform various cycles to simulate Florida weathering or create thermal shock.



The new Q-Trac II has double the specimen capacity of the original Q-Trac.

Accelerated Exposures

Materials tested on the Q-Trac are exposed to much more sunlight than those on a conventional outdoor exposure rack. A test specimen mounted on the Q-Trac receives an average of 5 times more UV than it would in Florida, because of the intensifying effect of the mirrors. Depending on the test starting time, you can get the equivalent of 3 years of Florida UV exposure in just 6 months.



Q-Trac Natural Sunlight Concentrators at Q-Lab Arizona give realistic test results in less time than natural exposures. They change position throughout the day to follow the sun.

Applications

Several standardized cycles – including desert, spray, freeze/thaw and interior (behind glass) – are available to test different materials and end-use applications. Customized exposures also may be designed.

The Q-Trac is useful for testing products including coatings, plastics and reinforced plastics, automotive materials, building materials, textiles, inks, sealants, and geosynthetics. Many correlation studies indicate that natural sunlight concentrators are particularly useful for testing coil coatings, powder coatings, automotive coatings, and several plastics.

Cost-Effective

The Q-Trac produces real-world results in a fraction of the time of natural exposures. This means that a new formulation or product can be brought to market faster, so you can take advantage of competitive opportunities.

Accelerated Natural Weathering Test Methods*

- Q-Trac Natural Sunlight Concentrator (ASTM G90, D4141, D4364; SAE J1961)
- Solar Tracking Exposures

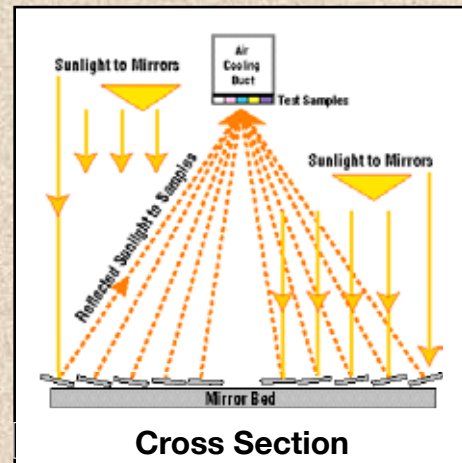
*Contact Q-Lab Weathering Research Service for a complete list

Q-Trac Natural Sunlight Concentrator

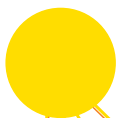
The Q-Trac uses a series of 10 mirrors to reflect full-spectrum sunlight and concentrate it onto your test specimens. This solar concentrating system maximizes the amount of sunlight exposure for test specimens.

Mirrors reflect sunlight onto test specimens.

Test specimens are mounted opposite the mirrors.



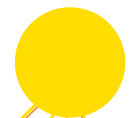
Following the Sun



Morning



Noon



Afternoon



The Q-Trac automatically follows the sun from morning until night. Dual-axis tracking allows it to move in any direction for both seasonal and daily adjustments.

Contract Laboratory Testing Services

- * Accelerated Weathering & Light Stability
- * Salt Spray & Cyclic Corrosion Testing
- * Easy, Inexpensive, Industry-Standard

For those who are interested in accelerated testing, we offer a full range of laboratory testing services. Q-Lab Florida has a fully equipped accelerated weathering and corrosion laboratory.

Q-Lab weathering and corrosion tests are used for quality control, material certification, exterior durability studies and predictions. Because you buy the test results, not the test equipment, these exposure and evaluation services are very affordable.

Fast Results. Although actual outdoor exposures are the ideal way to test your products, sometimes you can't afford to wait a year or two for real-time test results. We can give you fast, reliable weatherability data using QUV, Q-Sun, Q-Fog and QCT laboratory testers. Backed by decades of outdoor testing experience, Q-Lab can help you set up a successful accelerated laboratory testing program.

Standard Exposures. All tests and evaluations are performed to appropriate ASTM, ISO, SAE, AATCC, or other standard procedures. Custom exposures are also available.

Third-Party Verification. Q-Lab can act as an unbiased third party wherever third-party verification of test results is required.



In addition to outdoor testing, Q-Lab Weathering Research Service has a fully equipped accelerated weathering and corrosion laboratory in Florida.

Flexible. Q-Lab has a number of instruments available, allowing us to perform the most current and most widely specified range of environmental tests.

Laboratory Accelerated Weathering Test Methods*

- QUV Exposures (ASTM G154, D4587; SAE J2020; ISO 4892)
- Xenon Arc Exposures (ASTM G155, D2565; ISO 4892; AATCC TM 16, TM 169)

Laboratory Corrosion Test Methods*

- Salt Spray (ASTM B117)
- Prohesion (ASTM G85)
- Automotive Cyclic Corrosion Tests (GMW 14872; CCT-1, CCT-4)
- Weathering Corrosion Cycle (ASTM D5894)

*Contact Q-Lab Weathering Research Service for a complete list



The QUV Accelerated Weathering Tester simulates the highly damaging effects of sunlight, rain and dew.



Cyclic corrosion testing in the Q-Fog gives more realistic results than conventional salt spray because it reproduces conditions similar to actual atmospheric exposures.



Q-Sun Xenon Test Chambers provide the most realistic simulation of full spectrum sunlight.

Evaluation of Weathering Effects

It is important to quantify the results of any exposure testing program. Typically, customers are interested in the amount of change their material experiences during the exposure. Change in some properties, like color or gloss, can be measured with instruments. Other changes – like cracking, peeling, chalking, blistering, or rusting – can be evaluated visually and rated according to standard scales.

Visual Evaluations

Our staff members are actively involved in standards organizations and are familiar with evaluation techniques and reporting scales. Visual evaluation reports detail all defects observed, including cracking, blistering, peeling, chalking, adhesion, color change and corrosion. All visual ratings are made under standard lighting conditions to provide accurate, repeatable results.



Checking correct illumination with a lux meter before a visual evaluation.



Evaluating a test surface requires careful handling of the specimen.

Instrumental Measurements

Instrumental measurements of appearance and surface characteristics include gloss, distinctness of image, and color. These are used in place of, or in addition to, the visual ratings. Electro-optical measurements are now required by many standards, and provide the data from which statistical calculations can be made.

Mechanical Tests

Mechanical tests on physical properties are necessary for many products and materials. These tests include impact, pencil hardness, tape adhesion, tape chalk, bend, abrasion and adhesion.



Impact testing at Q-Lab Florida.



Washing specimens ensures that surface contaminants will not affect test results.

Frequency and Reporting

Evaluations and measurements can be scheduled on any time-frame. The property of interest is measured or rated prior to exposure. Evaluations are then performed on a monthly or quarterly basis to quantify the progress of the test specimen.

Reports are used to chart the time/ degradation progress. Q-Lab offers mailed reports and electronic data reports in PDF or Excel spreadsheet formats.

Additional Services

A complete test program often includes other special services or handling. Common services include washing, polishing, scribing and specimen weighing.

VISUAL EVALUATIONS

| Defect | Applicable Methods | | Defect | Applicable Methods | |
|-----------------|--------------------|------------|--------------------|--------------------|-------------|
| Chalk | ASTM D4214 | ISO 4628-6 | Dirt Retention | ASTM D3274 | |
| Blistering | ASTM D714 | ISO 4628-2 | Color Change | ASTM D2616 | ASTM D1729 |
| Cracking | ASTM D661 | ISO 4628-4 | Adhesion | ASTM D3359 | |
| Checking | ASTM D660 | ISO 4628-4 | Corrosion | ASTM D610 | ISO 4628-3 |
| Flaking/scaling | ASTM D772 | ISO 4628-5 | | ASTM D1654 | ISO 4628-8 |
| Erosion | ASTM D662 | | Filiform Corrosion | ASTM D2803 | ISO 4628-10 |
| Mildew | ASTM D3274 | | | | |

Q-Lab Weathering Research Service



Let Us Meet Your Testing Challenges

Testing services from Q-Lab give you the flexibility to meet industry standards, or to conduct your own proprietary testing program, at a very affordable cost.



In addition to regular outdoor exposures or accelerated laboratory testing, we can design customized tests for predicting product performance under actual service conditions. Our experienced staff can provide the reliable data you need to make critical decisions.

Whatever your testing challenges, we are here to help you.



Q-Lab Corporation

www.q-lab.com



**Q-Lab Headquarters
& Instruments Division**
800 Canterbury Road
Cleveland, OH 44145
USA
Tel. +1-440-835-8700
Fax: +1-440-835-8738

Q-Lab Europe, Ltd.
Express Trading Estate,
Farnworth
Bolton BL4 9TP
England
Tel. +44 (0) 1204-861616
Fax: +44 (0) 1204-861617

Q-Lab China
Room 1001
Yong Ding Bldg.
No. 3388 Gong He Xin Rd.
Shanghai, China 200436
Tel. +86-21-5879-7970
Fax: +86-21-5879-7960

Weathering Research Service
Q-Lab Florida
1005 SW 18TH Ave.
Homestead, FL 33034
USA
Tel. +1-305-245-5600
Fax: +1-305-245-5656

Q-Lab Arizona
24742 W. Durango St.
Buckeye, AZ 85326
USA
Tel. +1-623-386-5140
Fax: +1-623-386-5143