STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
BASIC ENVIRONMENTAL TESTING PROCEDURES FOR ELECTROTECHNOLOGY

Part 3—BACKGROUND INFORMATION

SECTION 7. AN APPRAISAL OF THE PROBLEMS OF ACCELERATED TESTING FOR ATMOSPHERIC CORROSION

This standard shall be read in conjunction with AS 1099.1, General, AS 1099.2Ka, AS 1099.2Kc and AS 1099.2Kd.

7.1 SCOPE AND OBJECT. This Section provides general information on accelerated tests for atmospheric corrosion.

The purpose of this Section is to provide background information on accelerated tests for atmospheric corrosion, e.g. contamination or deterioration of surface coatings due to corrosive atmospheres. It discusses various types of test, assesses their strengths and weaknesses and suggests what use can be made of them and what conclusions can be drawn.

Different applications of accelerated tests are covered including tests to predict performance under various conditions of use; tests to check the quality of materials and the influence of materials on each other and tests to check the functioning of equipment under corrosive conditions. Information is given on the standardizing of accelerated tests and the conclusions which can be drawn.

7.2 TESTS TO PREDICT THE PERFORMANCE OF A SPECIMEN UNDER CONDITIONS OF USE.

7.2.1 General. An ideal general corrosion test could be defined as a test that gives in a short time, preferably within a few hours but at least within a few days or weeks, a rating of the behaviour of a material, a component or an equipment that can be correlated with its performance under conditions of use over several years.

Such a test is not possible for several reasons:

(a) Conditions of use are not defined and vary over a very wide range.

(b) In order to accelerate corrosion phenomena, certain conditions have to be intensified with the danger that the mechanism of the attack and the appearance of the corrosion products may be changed.

(c) Different materials react very differently to intensifying of corrosive factors.

7.2.2 Conditions of Use. The following are the most important factors affecting the conditions of use:

(a) Climate, e.g. marine, rural, urban, industrial and tropical climates, or combinations thereof.

(b) Irregular variations in each climate from place to place and also at the same place, not only with the seasons but from year to year, from day to day and even from hour to hour.

(c) Exposure conditions, e.g. indoors, outdoors and, if outdoors, under shelter or in the open.

(d) Atmospheric pollution, e.g. dust and soot particles and corrosive gases other than those specific to the particular climate.

(e) Position of the test specimen, e.g. the attitude of the surface, horizontal, vertical or sloping; exposure to the sun; exposure to or shelter from rain. It is possible for one surface of a material to be much more corroded than another surface of the same material in the same equipment.

With these variations in conditions of use, it is clearly not possible to have one general accelerated corrosion test for predicting the behaviour of a component or equipment under conditions of use. One test, with variation of the severity produced by varying the duration of the test, e.g. one day for a rural atmosphere and four days for a marine atmosphere, gives no real information on the behaviour that can be expected in different types of climate, because the corrosive factors in these climates are different.

A better approximation may be obtained by using different tests for different climates, e.g. salt spray for marine climates or humid air with sulphur dioxide for industrial climates. Unfortunately, this will give only an alleviation of the problem, due to the factors (a) to (e).

These different general purpose tests are still very dangerous in their interpretation and may result in many misleading conclusions.

7.2.3 Methods to Accelerate the Corrosion Process.

7.2.3.1 *Usual changes.* To obtain the desired information in a short time, the corrosion process must be accelerated. This is done by changing some of the conditions of exposure. The usual changes are—

(a) increasing the temperature;

(b) increasing the relative humidity;

(c) increasing the extent of condensation;

(d) increasing the concentration of corrosive substance;

(e) increasing the duty cycle of corrosive conditions;

(f) application of voltage or current;

(g) mechanical stress;