



Corrosiveness of Metals (UN C.1)

Introduction

This method provides us with classifying the packaging category for the test item according to corrosive nature of the test time to the metals (Aluminum and Steel sheet).

General Principle

Three specimens of each metal are kept in contact with test item (large enough to prevent loss due to evaporation) in different conditions, at 55 ± 1 °C for 168 ± 1 hours (7 days) to check the effect of the test item on the respective metals in different conditions.

Methodology

Dimensions of Metals: 2 mm thick, 50 mm height, 20 mm width with a hole of 3 mm at the upper side to hang the metals.

The metals sheets were polished using grinding paper (sandpaper). The metals sheets were washed with alcohol in ultrasonic bath to remove any grinding remained, rinsed with distilled water followed by acetone and dried in an oven at 55 ± 1 °C for 15 minutes. The metals sheets were subsequently cleaned with absorbent paper (tissue paper) and metals were weighed (a, g). Visual change(s) in the sheets [i.e., shape, colour, and pits on its surface] were recorded.

Two kettles having enough capacity to hold 1500 mL of test item, having three openings with additional fourth opening for condenser were taken for steel and aluminum sheets, respectively. A volume of 1500 mL test item was taken in each kettle. The three sheets of each metal were tied with separate threads and placed in respective kettles. The metals sheets were placed in such a way that one metal was hanging above the test item layer (U: in the vapour phase of test item), the second one was hung mid-way (M: half portion is dipped in test item) and the third metal was completely dipped into the test item (L). The distance between the upper edge of the completely emerged specimen and the surface of the liquid was 10 mm. A condenser was attached to the fourth opening of all the kettles to prevent the loss of liquid.

Circulating bath was used to maintain the test temperature of the assembly. A cyrobath was connected with the condensers. The assembly was left undistributed for 168 hours with regular observation to check the volume of liquid. As there was no loss of liquid, additional test item were not added. After storage period, the kettles were detached from the circulating bath and cooled at room temperature.

The sheets were removed and cleaned. As there was no sign of corrosion on any of the sheets, acid inhibitor bath and nitric acid bath were not used and the sheets were washed with alcohol in ultrasonic bath, followed by distilled water, acetone and dried in an oven at 55 ± 1 °C for 15 minutes. The metals sheets were subsequently cleaned with absorbent paper (tissue paper).

After drying, visual change(s) in the sheets [i.e., shape, colour, and pits on its surface] were recorded. The sheets were weighed (b, g) again and the weight difference was calculated.

NOTE: A blank specimen of each metal was placed in separate kettle without test item as control. The sheets were weighed (c, g) before storage and the sheets were weighed (d, g) again after the storage period.

Criteria:

Observations and results are based on corrosion behavior of the test item to metals

For uniform corrosion

If the metals are uniformly corroded, then out of three the most corroded metals are taken for consideration and weight loss is determined. The results are considered positive if the % weight loss is greater than the below mentioned minimum % weight loss:

The above values are calculated based on 6.25 mm/year corrosion rate.

Exposure time (days)	Mass loss (%)
7	13.5
14	26.5
21	39.2
28	51.8

For Localized corrosion

If the metal shows localized corrosion instead of uniform corrosion, the metal having the deepest hole will be used to determine the depth of intrusion, is the depth of intrusion (determined metallographically) is greater the below minimum intrusion depth, the results are considered as positive.

Exposure time (days)	Minimum Intrusion Depth (µm)
7	120
14	240
21	360
28	480

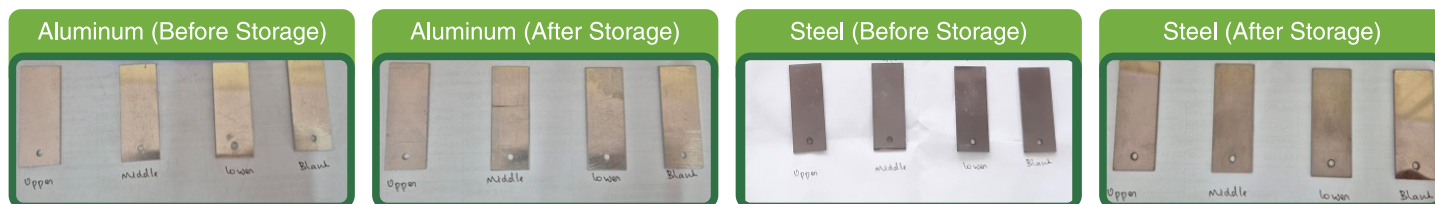
Observations

Observations of the metals were as follows:

The visual observations of both the metals were taken. Both aluminum and steel sheet were silver in colour and rectangular in shape and no pits were observed.

% weight loss for both metals were calculated. As there was no signs of corrosion no depth measurement was done.

Images of sheets:



Results

As both the aluminium and steel sheet did not show any localized corrosion and % weight loss for each metal was within the criteria of 13.5% changes over the surfaces, packaging group of the test item was **“Not Classified”**.

References

United Nations New York and Geneva, 2023: "Section 37: Classification Procedures, Test Methods and Criteria Relating to Corrosive to Metals (37.4.1 Test C.1: Test method for corrosion to metals)" Manual of Test and Criteria, Eighth revised edition ST/SG/AC.10/11/Rev.8., 2023.
United Nations, 2025: GHS ST/SG/AC.10/30/Rev.11, Globally Harmonized System of Classification and Labelling of Chemicals (GHS) – Eleventh Revised Edition. United Nations, New York and Geneva ISBN – 978-92-1-003272-5.



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