STANDARD: Ford TM 00.00-L-467

EQUIPMENT: AtmosfärLite

1. Scope

1.1 This methodology is to be used to undergo Mass Loss testing while performing the Ford TM00.00-L-467 test profile within an Atmosfar Specification chamber.

1.2 The test consists of a 7 day test profile divided into a 5 weekday repeating cycle followed by a 2 day weekend phase. The 5 day repeating cycle is made up of the following steps.

- A 6 hour wet phase at 25C, with intermittent exposure to salt solution (0.5%NaCl)
- A 2.5 hour transition phase with drying under climate control.
- A 15.5 hour phase with constant temperature and humidity (50C/70%RH).

1.3 The 2 day weekend phase is as follows;

- 48 hours at constant temperature and humidity (50C/70%RH).

2. Instrumentation

2.1 An Ascott Atmosfar chamber is required for the testing as an oscillating spray bar located at 1M above the target test area and psychrometric humidity reference.

3. Pre-Test Verification

3.1 The chamber should be run through at least one of the 24 hour daily cycles to ensure the temperature and humidity profiles are within specification.

3.2 Fallout testing using oscillating spray bar should be performed with collection vessels located at the lower sample height and collection rates of between 19 to 95ml/80cm2/ total programmed time of salt spray within the 6 hour wet phase. (See Fig 1.)

Figure 1

4. Sample Loading

4.1 The samples should be located at the lower sample height.

4.2 The samples should be oriented in a 'V' formation from the centre outwards to ensure equal salt deposition of each of the samples during the wet phase. (See Fig 2.)

4.3 The samples should be positioned at 20 (+/- 5) degrees from vertical, unless otherwise agreed.

4.4 The samples should be spaced so that no one sample shadows any other, and free airflow over the samples without obstruction.

4.5 The sample face to be tested in positioned to face up.

4.6 The test space should be split into 4 quadrants, each week the test samples should be rotated in a clockwise direction.

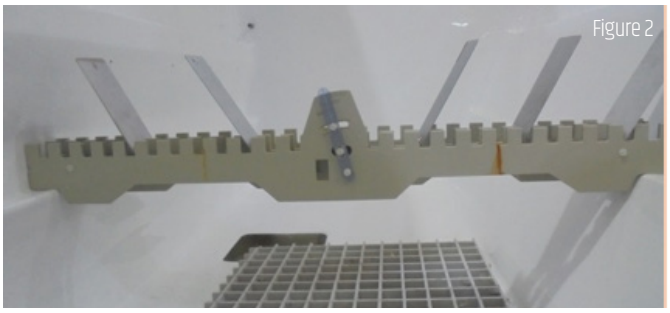


Figure 2

5. Salt Solution Preperation

5.1 Salt Solution Preperation - The salt solution is 0.5% +/- 0.05% NaCl by weight. Add 99.5L of water to 0.5kg of Ascott Corro Salt and mix until dissolved, measure concentration of solution and adjust if required.

5.2 pH is not subject to control but must be monitored and recorded.

6. Operation

6.1 Refer to customers specified requirements for sample preparation, but rubber gloves should be used when handling test samples to prevent contamination.

6.1.1 Test Object Orientation - the test samples shall be supported at 20 (+/- 5) degrees from vertical in plastic adjustable sample holders.

6.1.2 Test samples need to be approximately 1M from spray nozzles, one test sample should not shadow any other.

6.1.3 The sample holders should allow for sufficient airflow through and over the test samples.

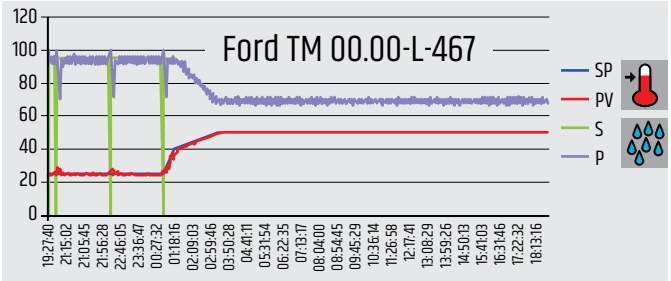
6.1.4 Duration of test - the agreed test duration is 6 weeks continuous testing.

6.1.5 Control before start of test - Run a cycle of the test with the chamber empty, also run 5 x19minute oscillating spray bar test to ensure the chamber is within specification. Record all results.

6.1.6 Start and end time of test - Test is only allowed to start at the 1st oscillating spray function and ands at the end of the weekend test.

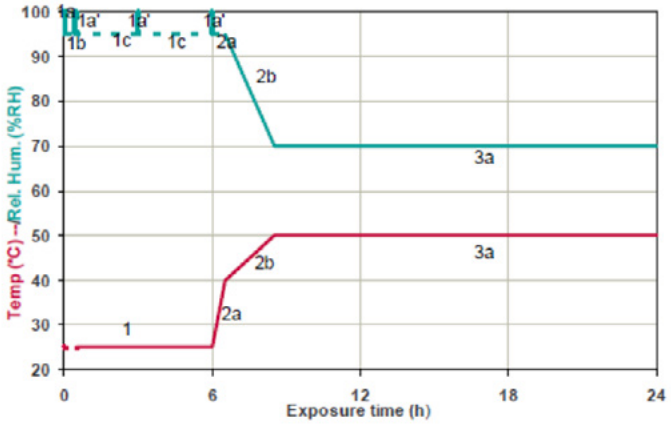
6.2 Test Exposure Conditions

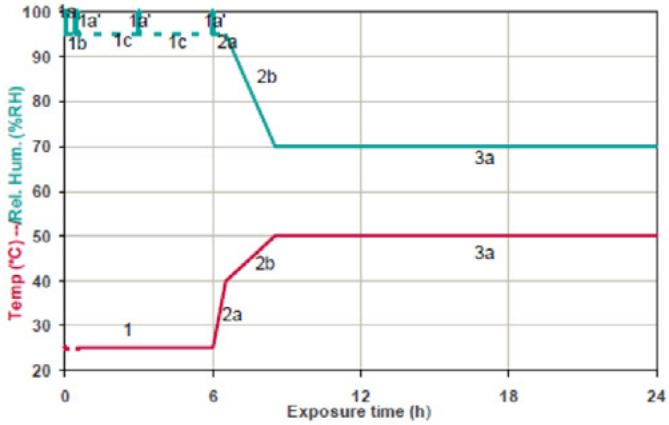
- A continuous wet phase with intermittent oscillating spray.
- A 2 step transition from wet to controlled humidity.
- A period under constant temperature and humidity control at 50C +/-2CC and 70%RH +/-5%. This is also the weekend phase.



Step	Time elapsed		Duration of step		Climate settings at start of step		Comments
no	h	min	h	min	T°C	%RH	
1a	0	0	0	10*	50*	70*	Spray thouroughly 0.5% NaCl to wet and cool
1b	0	10	0	20	30-50	wet	Cool chamber with maximum capacity
1a'	0	30	0	3	<30	wet	Spray to regain wetness (cooling dries)
1c	0	33	2	27	<30	wet(95)	25±2 to be reached within 1 hour from start (1a)
1a'	3	0	0	3	25±2	wet	Secure and support wetness by spraying
1c'	3	3	2	54	25±2	95	Continuation of wet phase conditions
1a'	5	57	0	3	25±2	95	Maintain wet conditions by spraying
2a	6	0	0	30	25±2	95	Start of quick temperature rise without drying
2b	6	30	2	00	40±0.6	95	Start of slow drying by diffusion
3a	8	30	15	30	50±0.6	70±3	Panels shall be free from visible wetness
3a	24	00	-	-	50±0.6	70±3	End of day 1 - day 5
Repeat steps 1a to 3a another four times before proceeding to step 3b							
3b	120	00	48	00	50±0.6	70±3	Constant temperature and relative humidity for the final 48 h of the seven day cycle
3b	168	00	-	-	50±0.6	70±3	
Repeat steps 1a to 3b for required number of weeks							

* Provided proceeding from step 3a or 3b.





The main cycle is 1 week duration and principally based on a repetition of sub-cycles 1 & 2.

Sub-cycle 1

Step 1:1 Oscillating Spray Down for 10 minutes

Step 1:2 ATCU for 1 minute at 25C/95%RH

Step 1:3 ATCU for 19 minutes at 25C/95%RH

Step 1:4 Oscillating Spray Down for 3 minutes

Step 1:5 ATCU for 1 minute at 25C/95%RH

Step 1:6 ATCU for 2 hours and 26 minutes at 25C/95%RH

Step 1:7 Oscillating Spray Down for 3 minutes

Sub-cycle 2

Step 2:1 ATCU for 1 minute at 25C/95%RH

Step 2:2 ATCU for 2 hours and 53 minutes at 25C/95%RH

Step 2:3 Oscillating Spray Down for 3 minutes

Step 2:4 ATCU for 30 minutes ramp to 40C/95%RH

Step 2:5 ATCU for 2 hours ramp to 50C/70%RH

Ford TM 00.00-L467				
Step	Function	Temperature	Time (HH.mm)	%RH
1	Sub 1			
2	Sub 2			
3	ATCU	50	15.30	70
4	Sub 1			
5	Sub 2			
6	ATCU	50	15.30	70
7	Sub 1			
8	Sub 2			
9	ATCU	50	15.30	70
10	Sub 1			
11	Sub 2			
12	ATCU	50	15.30	70
13	Sub 1			
14	Sub 2			
15	ATCU	50	15.30	70
16	ATCU	50	48	70

Enter repeats to complete duration of test - 6 week test will require 5 repeats

6.2.1 Operations within the wet phase at 25C/95%RH - Exposure shall be as written in Sub Programs 1 & 2. This will consist of 4 events of oscillating spray with control of 25C/95%RH in between.

6.2.2 Transition to controlled humidity - the ramp from 25C to 40C must be within 30 minutes. The ramp to 50C/70%RH should be set to 2 hours.at the final controlled humidity phase there should be no visible wetness on the samples.

6.2.3 Constant climate conditions of 50C+/-2CC/70%RH+/-5%RH - This phase will complete the 24 hour cycle and also for 48 hours after 5 daily cycles have been completed.

6.3 After Exposure

6.3.1 The test samples should be dried at 70C for 12 hours minimum and then wrapped in towel and finally sealed in zip bags which have desiccant bags inside, gloves should always be worn when handling test samples.

6.4 Quality Control

6.4.1 Daily check that the monitored temperature and humidity values are within the tolerances of the set values.

6.4.2 Weekly Checks - Check the spray nozzles are spraying correctly, change if necessary.

Check the salt solution is within 0.50% +/-0.05% NaCl, pH is not subject to control but should be monitored.

6.4.3 Photos are to be taken of test samples at the end of each weekly cycle.

6.5 Deviation Handling

5.5.1 General deviations such as downtime, out of tolerance recordings should be noted in the test report, including details of any alterations made.

5.5.2 Test Interruption - If the test is stopped for chamber failure are remedial work the samples should be stored at 18-28C/ 50-60%RH for a week at most.

7. Acceptance Criteria

7.1 Acceptance is determined by sample inspection at Ford.

8. Presentation of Data

8.1 Present data recordings for temperature and humidity profiles, salt solution checks, calibration certificates for all reference measuring devices used and calibration certificate for the test chamber used.

9. Summary of test Procedure

9.1 All equipment to be used should be calibrated prior to any pre-testing starting.

9.2 Pre-test profile for temperature and humidity to be performed for 1 full cycle (1 cycle = 1 week), this must be logged using ACC120

9.3 Oscillating spray down fallout testing to be performed, 5 x 19 minute tests with target fallout collection rates of 39.25 to 98ml per 19 minute tests, 8 measuring funnels to be used, 2 for each quadrant. These results must be recorded.

10. Summary of Daily Checks To Be Made During Testing

10.1 Daily checks to include reviewing previous 24 hour test results to ensure they are within specification, report any deviations as soon as possible.

10.2 Note any stoppages, out of tolerance results or chamber alarms that have occurred within the previous 24 hours.

11. Summary of Weekly Checks To Be Made During Testing

11.1 Check spray nozzles are operating correctly, change any defective nozzles and record change.

11.2 Check salt solution concentration is 0.5% +/-0.05%, adjust if required and record any changes.

11.3 Take photos of all test samples and record these.

11.4 Check salt solution storage tanks to ensure they are clean.

12. Summary of Bimonthly checks

12.1 Monitor the climate with an independent device. A Vaisala HM141 is recommended, place the device in the chamber test plane after the last spray phase and before the first wet phase. Confirm the mean values for temperature and humidity at the constant climate of 50C/70%RH during a working day cycle.

13. Quarterly Control Checks To Be Made During Testing

13.1 Check the spray nozzles deliver a uniform pattern and the spray mechanism works correctly.

13.2 Expose a minimum of 3 ACT test panels to the test procedure and ensure the gauge loss is within the specified limits of 150-250µm at 6 weeks of testing.

14. Summary of Weekly Checks To Be Made During Testing

14.1 Clean and service all equipment

14.2 Monitor the climate with an independent device Vaisala HM141 is recommended, place the device in the chamber test plane after the last spray phase and before the first wet phase. Confirm the mean values for temperature and humidity at the constant climate of 50C/70%RH during a working day cycle.

14.3 Check salt solution spray downfall is within the specified limits.

14.4 Ensure conductivity of solution meets the requirements.

14.5 Replace spray nozzles.

15. Summary of Post test Sample Handling

15.1 At the end of the test after the final set of photos has been taken, the test samples should be dried at 70C for at least 12 hours, they should then be wrapped in paper towel and stored in zip bags with desiccant bags to absorb any final moisture.

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Typical Daily Checks

Hours	Chamber Temp °C	Air Sat Temp °C	Collected ml/hr (2 vessels per atomiser)		Collected Solution pH	Reservoir Salinity %	Pump Speed	Atomiser Air Pressure PSI	Initials	Photos Taken
			1	2						