

STANDARD: Ford CETP 00.00-L-467**EQUIPMENT: AtmosfärLite****1. Scope**

- 1.1 This methodology is provided to give guidance to perform Mass Loss testing while performing the Ford CETP00.00-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 room temperature, with intermittent exposure to salt solution (0.5%NaCl)
 - A 2.5 hour transition phase with drying under climate control, this itself is performed in two parts, the first being a 30 minute ramp to increase temperature from 25C to 40C whilst maintaining a high humidity of 95%RH. The second part requires a 2 hour transition increasing temperature from 40C to 50C whilst simultaneously reducing humidity from 95%RH to 70%RH. These set values are the target conditions at the end of each phase.
 - 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 vertical airflow over the test samples, oscillating spray bar located at 1M above the target test area and psychrometric humidity reference.
- 2.2 Low conductivity meter
- 2.3 Independent temperature and humidity monitoring device.
- 2.4 Funnels and cylinders for fallout collection.

3. Ambient Conditions**3.1 Temperature**

- 3.1.1 The ambient temperature should be controlled to between + 18 to +23C
- 3.1.2 The chamber should be located to avoid direct sunlight and draughts that could cause fluctuations outside of the stated ambient temperature.

3.2 Humidity

- 3.2.1 The ambient humidity should be between 50 to 70%RH

4. Service Utilities**4.1 Water**

- 4.1.1 The water supply should be continuous and pressurised between 0.5 and 5.0 Bar.
- 4.1.2 The water supply should be deionised as detailed in the Ford test specification.
- 4.1.3 The water supply should be at ambient temperature.

4.2 Compressed Air

- 4.2.1 The compressed air supply should be controlled at between 4.0 and 6.0 Bar
- 4.2.2 The compressed air supply should be oil free and dried, it should be filtered to take out any particles above 5 microns.

4.3 Exhaust Vent to Atmosphere

- 4.3.1 The exhaust vent tube should be maximum of 3M, if this is to be extended then the diameter must increase to 150mm.
- 4.3.2 The exhaust should be routed so any u traps are avoided, it can go either up or down but it should not go down and then up.

4.3.3 The exhaust should be neutral pressure to prevent the climate of the test chamber being affected.

4.3.4 The exhaust should not be connected to any pipework where other equipment is connected.

4.4 Drain

4.4.1 The drain should be at a diameter of 21mm or larger.

4.4.2 The drain length shall be 3M maximum.

4.4.3 No part of the drain pipework to waste should be at a height higher than the chamber drain outlet.

4.4.4 The drain should not be connected to any pipework where other equipment is connected.

5. Pre-Test Verification

5.1 As specified in section 5.1.5 of the Ford test standard, the chamber should be run through at least one of the 24 hour daily cycle to ensure the temperature and humidity profiles are within specification.

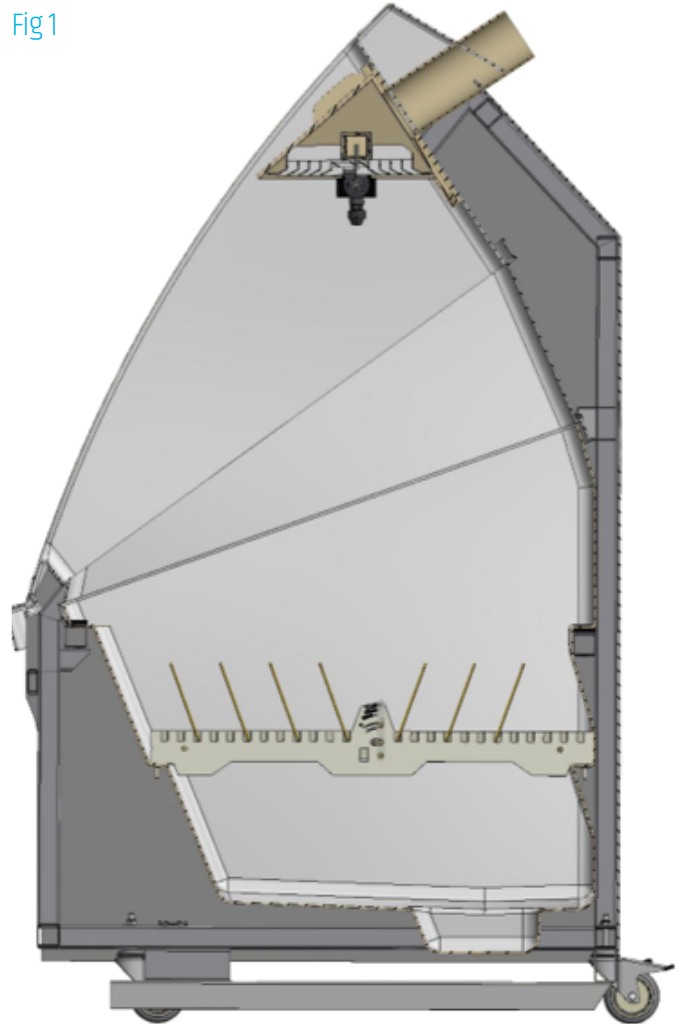
5.2 Fallout testing using oscillating spray bar should be performed with collection vessels located at the lower sample height and collection rates of between 39.25 to 98ml /80cm² of the total programmed time of salt spray within the 6 hour wet phase, i.e. 19 minutes.

6. Sample Loading

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

6.2 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. (Fig 1)

Fig 1



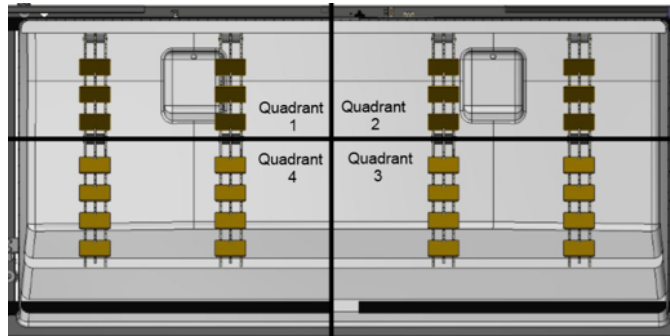
6.3 The samples should be positioned at 15 degrees from vertical, unless otherwise agreed.

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

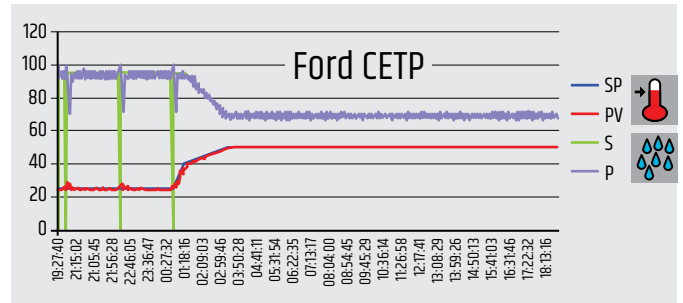
6.5 The sample surface to be tested should be positioned face up.

6.6 The test space should be split into 4 quadrants (Fig 2), each week the test samples should be rotated in a clockwise direction.

Fig 2



Weekday Cycle Performed in an Ascott At1300iP



7. Salt Solution Preparation

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

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

8. Operation

8.1 Check customer specification for any special requirements for sample preparation. Always wear protective gloves when handling test samples to prevent contamination.

8.1.1 Duration of Test - refer to customer specification.

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

8.2 Test Exposure Conditions

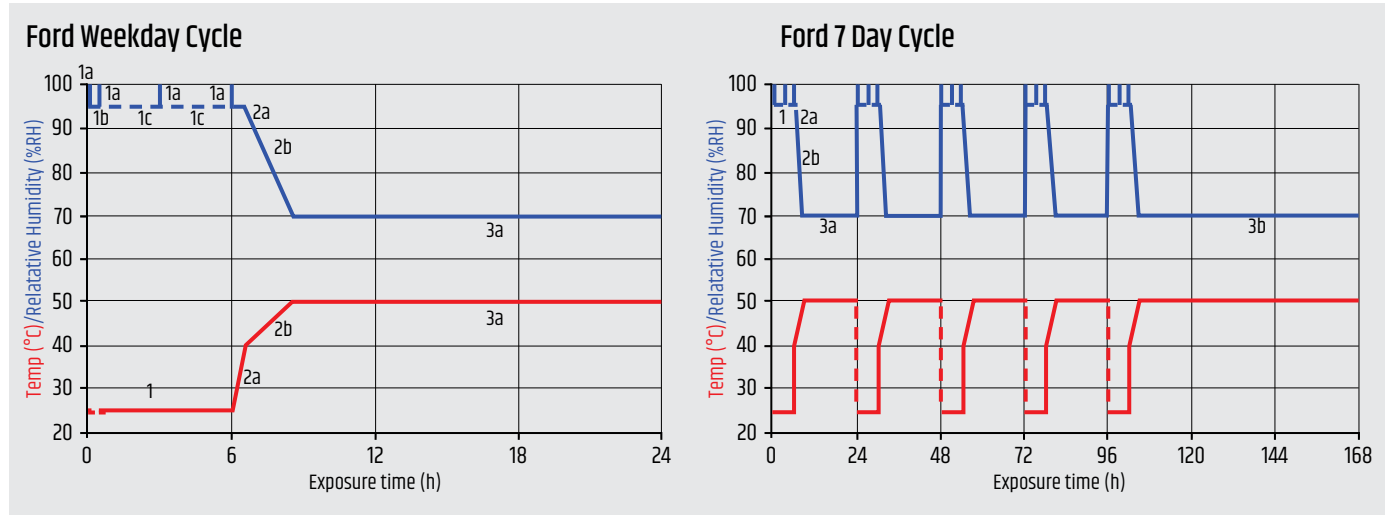
- A continuous wet phase with intermittent oscillating spray.
- A 2 step transition from wet to controlled humidity.
- A period under constant temperature and humidity control at 50C +/-0.6C and 70%RH +/-3%. This is also the weekend phase.

Ford Test Program Details

Table 1: Climate program, step by step in automated mode.

Step no	Time elapsed		Duration of step		Climate settings at start of step		Comments
	h	min	h	min	T°C	%RH	
1a	0	0	0	10*	50*	70*	Spray thoroughly 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	wet(95)	wet(95) = OK to set to 95% RH
1a'	5	57	0	3	25±2	wet	Defines wet condition before climate control
2a	6	0	0	30	25±2	wet(95)	Start of quick temperature rise without drying
2b	6	30	2	00	40±0.6	wet(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 workday procedure
Repeat steps 1a to 3a another four times							
3b	120	00	48	00	50±0.6	70±3	Phase in with weekends in case of manual operations in "workday" procedure
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.



Ascott Chamber Programming Instructions

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 at 5C.
- Step 1:2** Midi Unit for 1 minute at 25C/95%RH.
- Step 1:3** Midi Unit for 26 minutes at 25C/95%RH.
- Step 1:4** Oscillating Spray Down for 3 minutes at 5C.
- Step 1:5** Midi Unit for 1 minute at 25C/95%RH.
- Step 1:6** Midi Unit for 2 hours and 26 minutes at 25C/95%RH.
- Step 1:7** Oscillating Spray Down for 3 minutes at 5C.

Sub-cycle 2

- Step 2:1** Midi Unit for 1 minute at 25C/95%RH.
- Step 2:2** Midi Unit for 2 hours and 53 minutes at 25C/95%RH.
- Step 3:3** Oscillating spray down - 5C for 3 minutes.
- Step 2:4** Midi Unit for 30 minutes ramp to 40C/95%RH.
- Step 2:5** Midi Unit for 2 hours ramp to 50C/70%RH.

Ford CETP00.00-L467/ Volvo VCS 1027-1449				
1	Sub 1			
2	Sub 2			
3	Midi Unit	50	15.30	70
4	Sub 1			
5	Sub 2			
6	Midi Unit	50	15.30	70
7	Sub 1			
8	Sub 2			
9	Midi Unit	50	15.30	70
10	Sub 1			
11	Sub 2			
12	Midi Unit	50	15.30	70
13	Sub 1			
14	Sub 2			
15	Midi Unit	50	15.30	70
16	Midi Unit	50	48	70

Step Ramping set to ON.

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

8.2.1 Operations within the wet phase at $25 \pm 2^\circ\text{C}$ - Exposure shall be as written in Sub Programs 1 & 2. This will consist of 4 events of oscillating spray with control of $25^\circ\text{C}/95\%\text{RH}$ in between.

8.2.2 Transition to controlled humidity - the ramp from 25°C to 40°C must be within 30 minutes. The ramp to $50^\circ\text{C}/70\%\text{RH}$ should be set to 2 hours at the final controlled humidity phase there should be no visible wetness on the samples.

8.2.3 Constant climate conditions of $50^\circ\text{C} \pm 0.6^\circ\text{C}/70\%\text{RH} \pm 3\%\text{RH}$ - This phase will complete the 24 hour cycle and also for 48 hours after 5 daily cycles have been completed.

8.3 After Exposure

8.3.1 The test samples should be treated to the customers specifications, however protective gloves should be worn when handling test samples.

8.4 Quality Control

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

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

8.4.3 Check the salt solution is within $0.50\% \pm 0.05\%$ NaCl, pH is not subject to control but should be monitored.

8.4.4 Photos are to be taken of test samples at the end of each weekly cycle (unless customers test specification has own requirements).

8.4.5 Bi-Monthly Checks - Monitor the climate with an independent measuring device at the start of the 40°C temperature increase and removing it before the start of the first spray down phase.

Check the condition of the psychrometric wet sock material, cleaning or changing if required.

8.5 Annual Checks

8.5.1 Full chamber calibration and service required.

8.6 Deviation Handling

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

8.6.2 Test Interruption - If the test is stopped for chamber failure or remedial work the samples should be stored at $18-28^\circ\text{C}/50-60\%\text{RH}$ for a week at most.

9. Acceptance Criteria

9.1 Acceptance is determined by sample inspection by the customer.

10. Presentation of Data

10.1 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.

11. Summary of Test Procedure

11.1 All equipment to be used is to be calibrated prior to any pre-testing starting.

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

11.3 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 logged.

12. Summary of Daily Checks to be Made During Testing

- 12.1 Daily checks to include reviewing previous 24 hour test results to ensure they are within specification, report any deviations as soon as possible.
- 12.2 Note any stoppages, out of tolerance results or chamber alarms that have occurred within the previous 24 hours.

13. Summary of Weekly Checks to be Made During Testing

- 13.1 Check spray nozzles are operating correctly, change any defective nozzles and record change.
- 13.2 Check salt solution concentration is 0.5% +/-0.05%, adjust if required and record any changes.
- 13.3 Take photos of all test samples and record these.

A) Weekly Chamber checks

Cycle	Ph	Salinity	Initials	Photos Taken
1				
2				
3				
4				
5				
6				

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