

VEHICLE INTERIOR AIR QUALITY (VIAQ) TEST PROCEDURES & PROPOSAL

30 March 2016

KATRI, The Republic of KOREA
(Korea Automobile Testing & Research Institute)

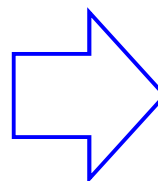
◆ VIAQ Management Standards

- ✓ **Law** : Motor Vehicle Management Act No.33-3(The management of newly-made vehicle's interior air quality)
- ✓ **Standard** : Ministry of Land, Infrastructure and Transport Notification No. 2013-549
- ✓ **Enforcing body** : Ministry of Land, Infrastructure and Transport
- ✓ **Testing agency** : KATRI(Korea Automobile Testing & Research Institute)

◆ VIAQ Check Tests

Article 5 (Considerations for Motor Vehicle Manufacturers and Sellers):

Motor vehicle manufacturers should record the results of the Interior Air Quality of Newly Manufactured Vehicles and retain them for 5 years.

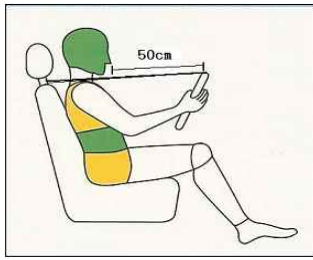


Article 6 (Inspection of Conformity to Recommendation Standards)

The Ministry of Land, Infrastructure and Transport check whether the vehicle conforms to the recommended standards once a year.

◆ VIAQ Check tests

✓ VIAQ Test Procedure



Time	Temp Stabilization Min. 12 hours	Ventilation 30 min	Doors Closed 2 hours	Sampling 15min
Cabin Temp	25 ± 2 °C	25 ± 2 °C	25 ± 2 °C	Day 1 : Sample 1,2,3 Day 2 : Sample 4,5,6

✓ VIAQ Recommendation Standard

Item ($\mu\text{g}/\text{m}^3$)	Formaldehyde	Benzene	Toluene	Xylene	Ethyl benzene	Styrene	Acrolein
Limit	210*	30	1,000	870	1,000*	220*	50*

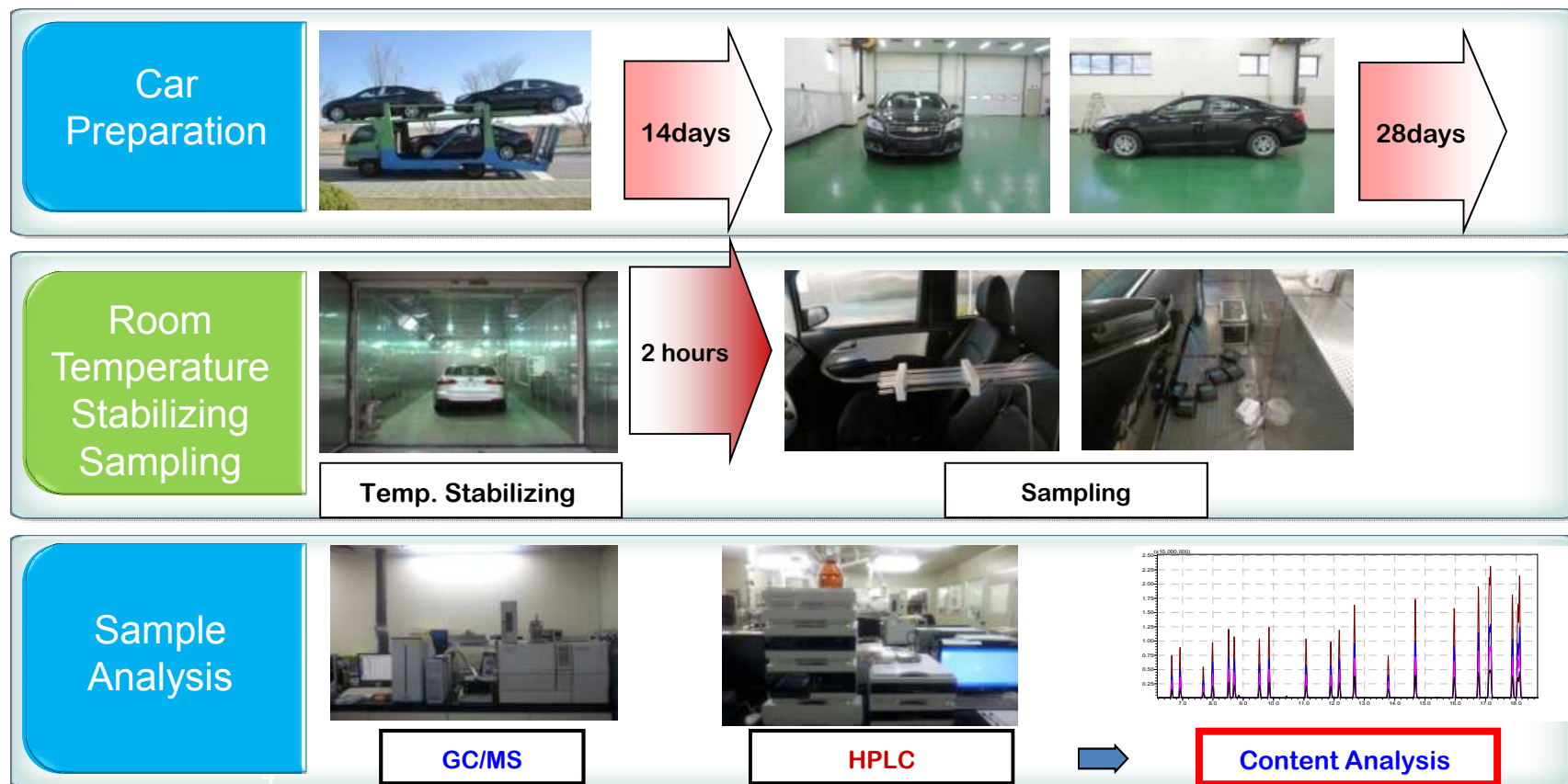
* These Limits were amended (MOLIT Notification No.2013-549, 24/09/2013)

VIAQ Check Tests in Korea

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- ◆ Korea established VIAQ standards in 2007, enacted in 2010
- ✓ Check whether automobile manufactures comply with VIAQ standards



Case Study in KOREA

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● Improvement case of VIAQ

- ✓ Harmful substances are reduced by using environmentally friendly material, etc.
- ✓ There are assessment tests each step in the process for managing VIAQ to reduce harmful substances(e.g. VOCs)

Tier 1

- Completion of Assembly
- VIAQ Assessment test



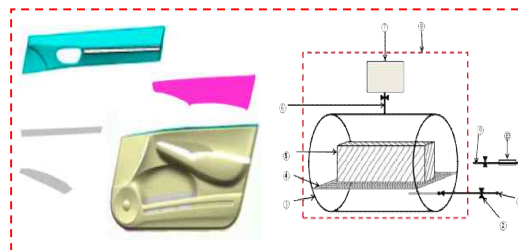
Tier 2

- Assembly VOC test
- Unit components

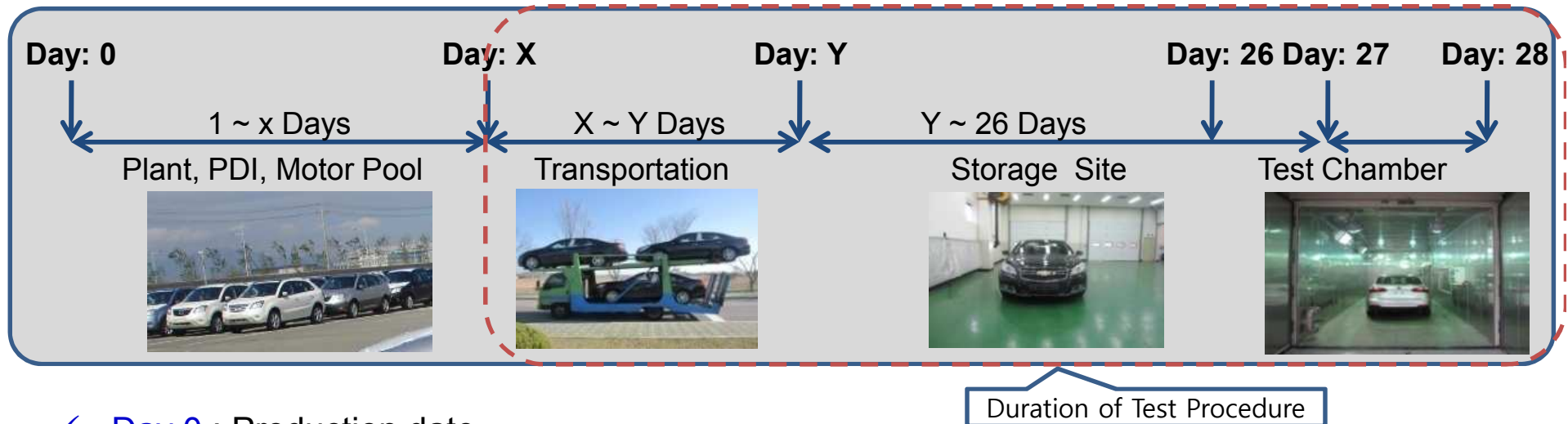


Tier 3

- Environmentally friendly material
- BTX Free adhesive
- Vacuum and thermal process
- hot dry process(infra-red heat)
- water soluble solvent



◆ VIAQ Test Procedures



- ✓ Day 0 : Production date,
- ✓ Day 0 ~ X : After production, cars are usually parked in the manufacturing plant.
- ✓ Day X ~ Y : Transport from the plant to the laboratory
- ✓ Day Y ~ 26 : Keep test cars at the building
- ✓ Day 26 : All protective covers, foils, papers etc. should be removed before test start
- ✓ Day 27 : Test start, start ambient mode through overnight soak time.
- ✓ Day 28 : Test finished, finish ambient, parking and driving modes.

◆ Vehicle category

- ✓ **M1** – Vehicles used for the carriage of passengers and comprising not more than eight seats in addition to the driver's seat.
- ✓ **N1** – Vehicles used for the carriage of goods and having a maximum mass not exceeding 3.5 tonnes. [request to add “N1”](#)
- Every vehicle can be faced with vehicle interior air quality issues, because they are made from new chemical interior materials. Due to realistic restrictions, it is very difficult to address all vehicle categories. The harmonized test procedure can easily apply to vehicle categories M1 and N1. So, any contracting parties can choose the vehicle categories depending on their situations.

	KOREA	CHINA	JAPAN(JAMA)	ISO	VIAQ IWG
Vehicle Category	Light Duty Vehicle (·LD Passenger car, LD Bus, LD Truck) “MOLIT 2003-549”	M1, M2, M3 and N “HJ/T 400-2007”	·Passenger car ·Bus ·Truck JAMA Report No.98	·Passenger car “ISO 12219-1”	?

◆ Production date definition

✓ **Production date** : sign off date of the production line

Production date: This date is when the final test of vehicles is finished in the production line and it can be checked on the document of the manufacturing certificate by Motor Vehicle Management ACT.

[별지 제10호서식] <개정 2013.12.27>

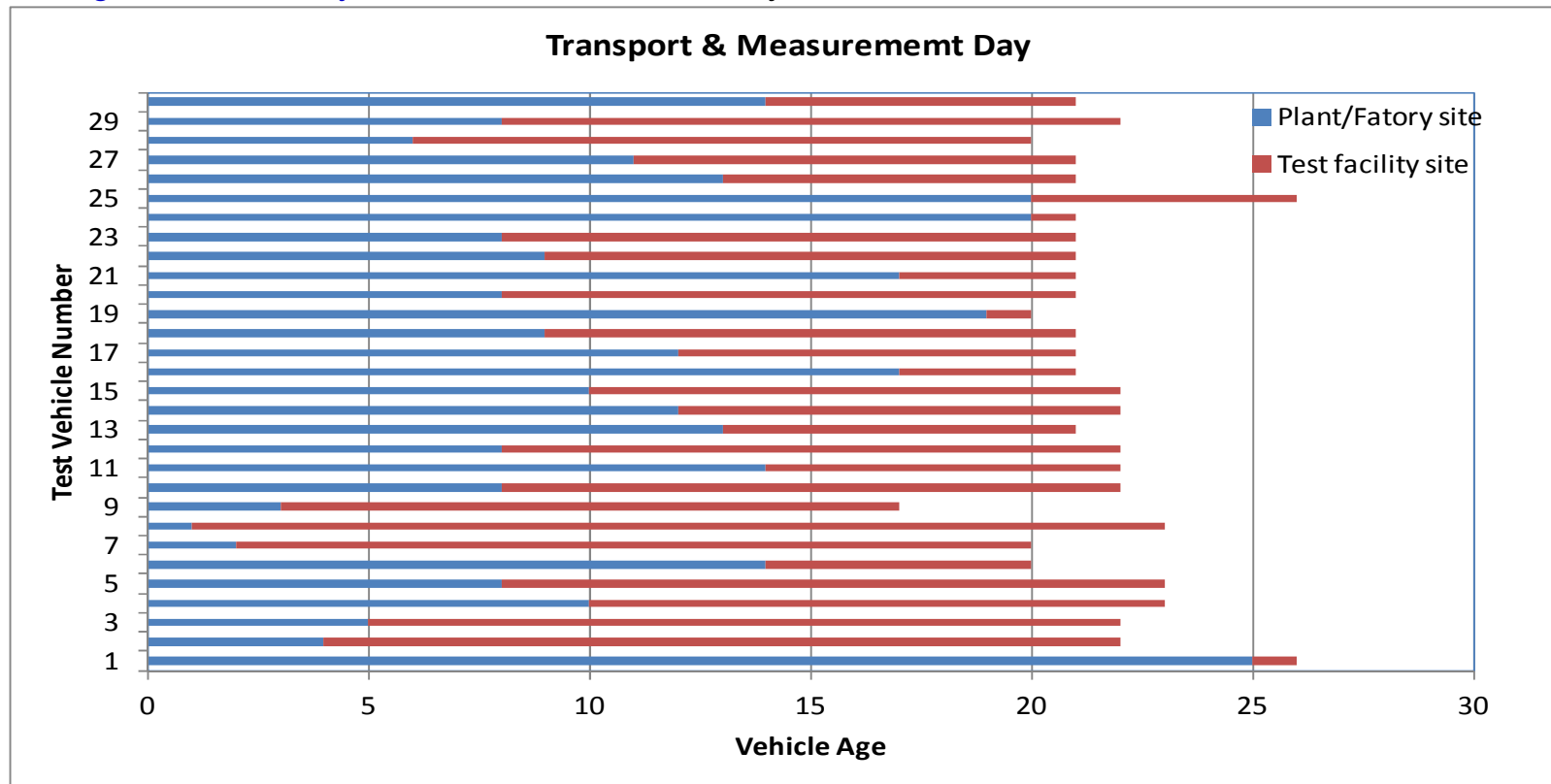
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	차 명 (형 식)		모 델 연 도
	총 중 량		승 차 정 원
	최 대 적 재 량		배 기 량 (기 통 수)
	색 상		원 동 기 마 력
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	대 표 자	(서 명 또는 인)	
	사 업 자 등 록 번 호		
	소 재 지		

VIAQ Test Procedures & Proposal

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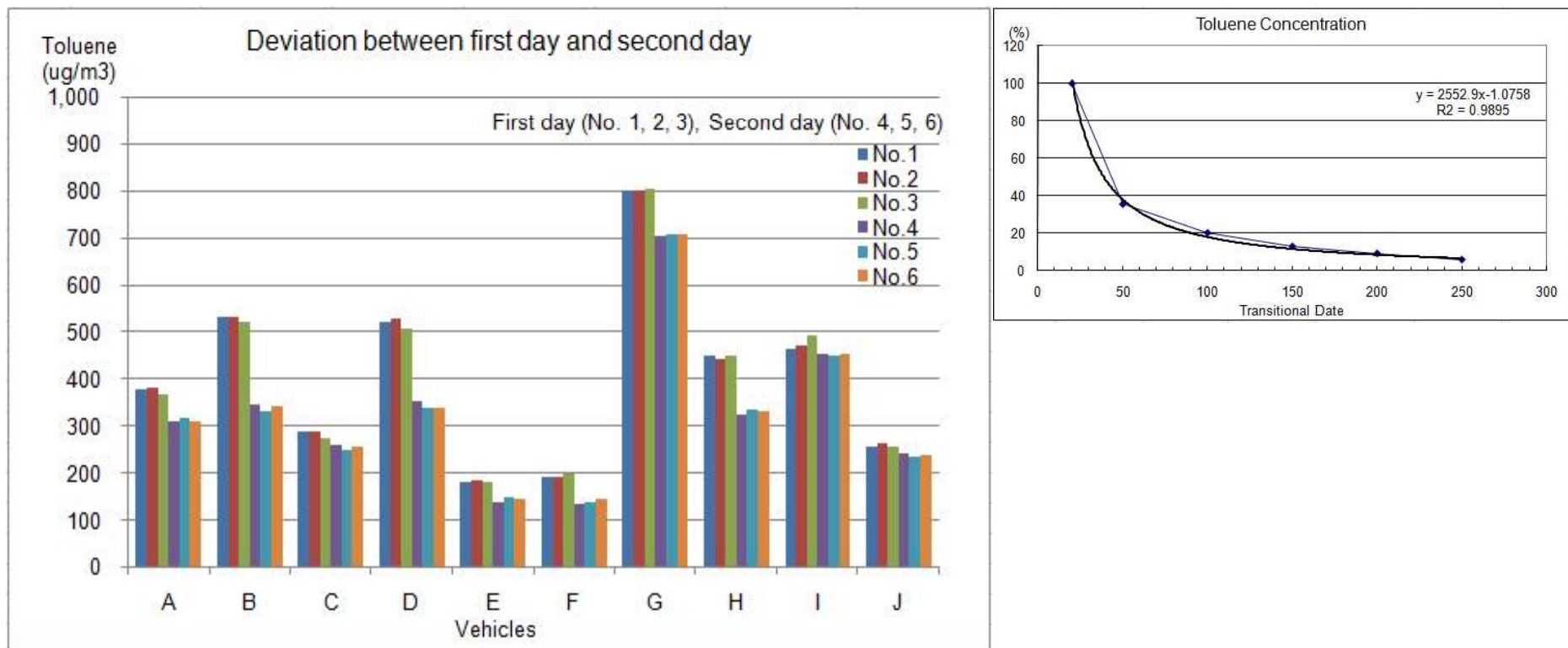
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- ◆ Vehicle age at testing date: 28 days \pm 5days after the production date.
- ✓ Check tests is possible after production that means everything to be ready for customer.
However , due to VOCs characteristics, not have testing chamber in all plants, need to be transition period
- ✓ Storage in Factory or motor pool(PDI) : Day 0 ~ Day X (min.1 ~ max. 25)
- ✓ Storage in Test facility : tested within 14 ~ 28 days



VIAQ Test Procedures & Proposal

- ◆ Vehicle age at testing age: 28 days \pm 5days after the production date.
- Regarding the 5 day margin, the age of the vehicle at measurement should be 28 days, or as close as possible to 28 days, because the difference of 10 days could result in high variability in the test results. If it is not 28 days, it can be documented with the reason.



VIAQ Test Procedures & Proposal

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- ◆ Storage in plants : Day 0 ~ X
- ✓ Most cars parked in motor pool outside.
- ✓ It is difficult to deal with storage conditions in the plants as a test operator



◆ Transport: Day X ~ Y

✓ Transport conditions

- The climate control systems should be set in the recirculation mode.
- All doors and windows should be closed.
- If the vehicle outer surface has been contaminated during transportation, the outer surface of the vehicle should be cleaned using clean water.
- Workers should carefully deal with the vehicle to prevent contamination.
- Leave the protective covers in their states.



◆ Storage in test facility: Day Y ~ 26

✓ Storage conditions

- The vehicle should be stored inside a building with the vehicle's doors and windows closed so that it can be protected from direct sunlight and contaminants.
- The climate control systems should be set in the recirculation mode.
- Workers should carefully deal with the vehicle to prevent contamination.
- Leave the protective covers in their original states.
- If needed, test vehicles may be cleaned using clean water, not cleaning agents.



◆ One day before measurement(protective covers): Day 26 ~ 27

✓ Protective covers should be removed one day before taking measurements

- After removing the protective covers, stabilizing the temperature is very important. So we suggest that test vehicles should be kept as close as possible to 25 °C to stabilize interior emission rates between removing protective cover and taking measurements.

◆ Soak Temperature: Day 27-28

✓ Soak temperature in Ambient mode: 25 °C

- Emission rates increase gradually as temperature rises up.
- The temperature (20 °C ~ 30 °C) commonly used by people in buildings, homes and vehicles.
- * The average temperature in Summer(August) during 30 years(1971-2000) : 24.9 °C
- * IUPAC (SATP, Standard Ambient Temperature and Pressure): 25.0 °C
- At this time, we will propose 25 °C as the soak temperature to harmonize test procedures. If we choose either 23 °C or 25 °C, the higher emission rate is the better solution to get the repeatability of test results.

◆ Soak time in Ambient mode: Day 27-28

✓ Soak time in Ambient mode: 16 hours

- Regarding the soak time, in case of ambient mode soak time, We suggests a 16 hour soak time rather than a $14h \pm 2h$ soak time because a 16 hour soak time is more suitable for an 8 work hour day.

The reports from the automotive industry are that working hours of the operator are usually 9 to 6 or 8 to 5, so a 16 hour soak time is most suitable for an 8 hour shift. A 14 hour soak time would require the operator to work for an additional 2 hours.

< Test Timeline for 16 hour soak time (9 to 6 work time) >

17:30 PM doors open start (30 min)

18:00 PM door s close stop, ambient mode start (16 hour soak time)

10:00 AM sampling start (30 min)

10:30 AM sampling stop, ambient mode stop, parking mode start (4 hour)

14:00 PM sampling start (30 min)

14:30 PM sampling stop, parking mode stop, driving mode & sampling start (30 min)

15:00 PM sampling stop, driving mode stop. (in case of preparing for a repeat test)

17:30 PM Vehicle cooling ...

◆ Parking mode & Driving mode

- ✓ Test parameters of parking and driving mode should be reviewed.
 - The total test time should be decided after all three test modes have been reviewed.
 - We have not yet seen any technical data from parking and driving modes.

- ✓ Parking mode:
 - Light or Temp control?

- ✓ Driving mode:
 - HVAC conditions with the same setting as test conditions ? (lowest temp, max fan speed, recirculation mode, etc.)

Thank you very much !

