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DRAFT AMENDMENT TO ATP ON PROCEDURES FOR TESTING AND APPROVAL OF MULTI-COMPARTMENT MULTI-TEMPERATURE VEHICLES

Transmitted by the Government of France

Note by the secretariat

The secretariat reproduces below the following proposal submitted by the Government of France.

E. TEST PROCEDURE FOR MULTI-COMPARTMENT MULTI-TEMPERATURE VEHICLES

61. Tests may be carried out:

Either on the complete vehicle, equipped (where applicable) with one or more thermal appliances,

or, in the case of refrigerated equipment, separately for the body (not fitted with a thermal appliance) and the refrigerated unit during measurement of the effective refrigerating capacity according to the procedures described in paragraphs 64 to 66.

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Testing on the complete vehicle

62. To measure the K coefficient of each compartment, the procedures described in paragraphs 1 to 15 of this Annex shall be applied. The K coefficient of each compartment shall be measured with the doors of the other (unheated) compartments open. If the vehicle is fitted with a moveable intermediate wall, this shall be placed at the mid-point of its range of mobility.

63. To determine the efficiency of the thermal appliance(s) (if any) with which each compartment is equipped, the procedures described in paragraph C of this Annex shall be followed. In addition, in the case of new equipment, a heating appliance with a capacity equal to 35% of the heat exchanged in continuous operation through the walls for the class in question, with the intermediate wall being treated as an external wall, shall be installed in each compartment.

Tests carried out separately for the body (not equipped with a thermal appliance) and the multi-evaporator refrigeration unit during the measurement of effective refrigerating capacity

64. In measuring the insulating capacity of a body not equipped with a thermal appliance, the procedures described in paragraphs 1 to 15 of this annex shall be applied. If the vehicle is equipped with a moveable intermediate wall, this shall be placed at the mid-point of its range of mobility. Depending on the lengthwise homogeneity of the walls of the body, the following special procedures shall be applied:

(a) The thickness and/or insulation of the sidewalls, roof and floor are homogeneous over the length of the walls

In the case of two-compartment units, regardless of whether the intermediate wall is fixed or movable, the insulation of the body shall be determined by the transmission coefficients "K" and "k", as follows:

(i) The K coefficient of the body, i.e., both of the compartments together, shall be measured using the ATP test method for multi-compartment tanks. If the intermediate wall is moveable, it shall be placed at the mid-point of its range of mobility. The K coefficient value must be equal to or less than the limits for the classes being sought (0.40 W/m^2K for heavily insulated equipment or 0.70 W/m^2K for normally insulated (IN) equipment);

(ii) The k coefficient of the intermediate wall shall be determined on the basis of the foregoing test and of the K coefficient of one of the compartments (the other compartment being at the external temperature with its door open). The k coefficient value of the intermediate wall must also be equal to, or lower than, 1.5 W/m^2K, regardless of the class being sought for each compartment.

The k coefficient of the intermediate wall may be used to describe an intermediate wall of the same type (same thickness and type of insulation,

same leakproofness), of equal or smaller dimensions (height and width), installed in a body with the same specifications, but with dimensions different from those of the body on which the intermediate wall test was carried out. The type approval certificate for this body shall show that it is equipped with slide rails for an intermediate wall (or meat bars having anchoring areas comparable to those necessary for a moveable wall).

For equipment with more than two compartments, the test laboratory shall decide which method is to be used to determine the k coefficient specific to each wall, while complying with the same principle as above and using the information provided by the manufacturer.

Only the K coefficient value shall be considered for the approval of each compartment, in accordance with appendix 2, paragraph 41, of ATP.

(b) The thickness and/or insulation of the sidewalls, roof and floor are not homogeneous over their whole length

In this case, the K coefficient of each compartment shall be measured using the test procedures for single-compartment equipment, with the doors of the other compartments being open.

The K coefficient values obtained for each compartment shall be taken into account for the approval of each compartment, in accordance with appendix 2, paragraph 41, of ATP.

The value of each K coefficient shall be taken into account for the approval of each compartment, in accordance with appendix 2, paragraph 41, of ATP.

65. In measuring the effective refrigerating capacity of multi-evaporator refrigerating units, the procedures described in paragraphs 51 to 59 of this annex shall be applied, in addition to the special procedures described below.

The application of each set of operating conditions shall be preceded by a thermostatic check, without additional heating other than that produced by the unit to be tested, in order to identify the type of operation and regulation of the test unit.

The effective refrigerating capacity in each room-calorimeter without a common wall shall be measured for three different set temperature conditions (between - 25° C and + 12° C) as shown, for example, in lines 1, 2 and 3 of the tables below. During the measurement, the compressor shall be in continuous operation at its maximum setting. The tests described in columns 4 and 5 (and 6) of the tables below are not mandatory. They may be performed at the manufacturer’s request to demonstrate the capacity of the equipment in specific (thermostat-controlled) operating conditions.

Table 1

Maximum effective refrigerating capacity measured in set operating conditions, at the temperatures indicated below:

E	Evaporator No. 1		Evaporator No. 2		Evaporator No. 3		Observations
No.	T1 (°C)	Wo1 (watts)	T2 (°C)	Wo2 (watts)	T3 (°C)	Wo3 (watts)	
1	- 20		- 20		- 20		
2	- 10		- 10		- 10		
3	0		0		0		
4	12		12		12		
5	- 20		0		12		Possible, impossible or thermostat-controlled (*)
6	0		12		- 20		Possible, impossible or thermostat-controlled (*)
7	12		- 20		0		Possible, impossible or thermostat-controlled (*)

E = evaporators (2, 3 or X as the case may be)
No. = test number
(*) = delete as necessary
T1 = temperature inside first room-calorimeter
T2 = temperature inside second room-calorimeter
T3 = temperature inside third room-calorimeter
Wo1 = effective refrigerating capacity supplied by first evaporator
Wo2 = effective refrigerating capacity supplied by second evaporator
Wo3 = effective refrigerating capacity supplied by third evaporator

Table No. 1 shows the values measured in specific operating conditions. This table should not be taken into account for the approval of a unit, in accordance with annex 1, appendix 2, paragraph 41, of ATP.

The conclusions of the test report shall contain a second table showing the effective refrigerating capacities interpolated (for the various ATP class temperatures) using the measured capacity curbs Wo = f.(To) obtained.

In accordance with annex 1, appendix 2, paragraph 41, of ATP, the first four lines shall show the values to be taken into account for approval (for calculating the heat balance). The last three lines shall show whether self-contained operation is possible.

Table 2

Maximum effective refrigerating capacity measured in set operating conditions, at the temperature goals below

E	Evaporator No. 1		Evaporator No. 2		Evaporator No. 3		Observations
No.	T1 (°C)	Wo1 (watts)	T2 (°C)	Wo2 (watts)	T3 (°C)	Wo3 (watts)	
1	- 20		- 20		- 20		
2	0		0		0		
3	12		12		12		
4	- 20		0		12		Possible, impossible or thermostat-controlled (*)
5	0		12		- 20		Possible, impossible or thermostat-controlled (*)
6	12		- 20		0		Possible, impossible or thermostat-controlled (*)

E = evaporators (2, 3 or X as the case may be)
No. = test number
(*) = delete as necessary
T1 = temperature inside first room-calorimeter
T2 = temperature inside second room-calorimeter
T3 = temperature inside third room-calorimeter
Wo1 = effective refrigerating capacity supplied by first evaporator
Wo2 = effective refrigerating capacity supplied by second evaporator
Wo3 = effective refrigerating capacity supplied by third evaporator

In the case of multi-evaporator refrigerating units, "self-contained operation" means the ability to obtain all the ATP reference temperatures in continuous (non-thermostatically-controlled) operation, in any compartment with the other compartments also in continuous operation, at any ATP reference temperature, and with the compressor in continuous operation at maximum setting.

In the case of multi-evaporator refrigerating units, "non-self-contained operation" means that the above conditions cannot be achieved or that they can be achieved only with thermostatically-controlled feeding of the evaporators, which causes the refrigerating capacity to alternate from one evaporator to another.

66. **Test report**

An appropriate test report conforming to the attached model No. 11 shall be drawn up.

The test report shall, in particular, contain the following information:

A description of the equipment,

The cooling specifications of each evaporator,

Table 1 showing the test results,

Table 2 showing the effective refrigerating capacities and the possibilities for self-contained operation (indicated with an "X"),

Whether the unit has a heating appliance for maintaining the temperature at up to + 12° C in each compartment (if so, approval can be granted for classes A, B or C; if not, approval can be granted only for classes D, E or F).

F. PROCEDURE FOR ASCERTAINING CONFORMITY OF MULTI-COMPARTMENT AND MULTI-TEMPERATURE EQUIPMENT

67. Approval of a multi-compartment unit with one refrigerated or mechanically-refrigerated compartment and one or more insulated compartments

Each compartment is to be approved separately for the classes requested by applying the provisions concerning inspection of a new unit for conformity with a (tunnel-tested) reference unit of a series as defined in paragraph 2 (c) (i), (ii) or (iii) of annex 1, appendix 1 of ATP.

In assigning a K coefficient to each compartment, the procedure described in paragraphs 62 to 64 shall be applied. The "k" coefficient of the wall should be lower than or equal to 1.50 $W/m^2.K$.

68. For the approval of the refrigerated (or mechanically-refrigerated) compartment using the separate test reports (type approval certificate) for the body and the unit, the refrigerating capacity of the unit must be checked to make sure that it is equal to or greater than 1.75 times the net heat flux through the walls of this compartment for the class requested. The mean surface area of each compartment shall be calculated with the movable wall (where there is one) in the position furthest from the side opposite the heat exchanger, with the intermediate wall being treated as an external wall.

69. Approval of refrigerated and/or mechanically-refrigerated multi-compartment equipment equipped with units that are completely independent of each other

The provisions for approval of such equipment are identical to those in 68 above.

70. Approval of a vehicle with several refrigerated and/or mechanically refrigerated compartments, equipped with a centralized, refrigerating or mechanically refrigerating cold-production appliance

Each compartment is to be approved separately for the class requested by applying the provisions concerning inspection of the equipment to be approved for conformity with tunnel tested equipment or by reference to a series defined in paragraph 2 (c) (i) (ii) or (iii) of Annex 1, Appendix 1 of ATP.

To assign a K coefficient to each compartment, the procedure described in paragraphs 62 and 64 shall be applied. The k coefficient of the wall should be lower than or equal to 1.50 $W/m^2.K$.

For the approval of each compartment in a refrigerated class, on the basis of separate test reports (type approval certificate) for the body and the unit, the effective refrigerating capacity for each evaporator must be verified using table No. 2 to ensure that it is equal to or greater than 1.75 times the heat flux through the body walls of the compartment being considered for the class requested.

The mean surface area of each compartment shall be calculated with the movable wall in the position furthest from the side opposite the heat exchanger, with the exchange surface of the intermediate wall being treated as an external wall.

71. Approval of multi-compartment equipment with one or more refrigerated or mechanically refrigerated compartments, and one compartment in which the temperature can be set with a fan built into the intermediate wall which can provide air circulation (with or without a thermostat) from the refrigerated or mechanically refrigerated compartment into the compartment which is insulated only

Each compartment shall be approved separately for the class requested by applying the provisions concerning the conformity of the unit with a (tunnel-tested) reference unit of a series as defined in paragraph 2 (c) (i), (ii) or (iii) of Annex 1, Appendix 1 of ATP, but limited for a lower or equal refrigeration reserve or effective refrigerating capacity (per surface unit).

The test report shall deal with the efficiency of the whole unit (see paragraph 63). It shall state not only that the cold production equipment is sufficient for the approval of the main compartment in which the evaporator is installed, but also that the secondary compartment may be approved for the class requested.

72. Special identifying marks

Multi-compartment units shall bear identifying marks showing that each compartment has been approved. The expiration date of the approval shall be the same.

Example: RRC/FRC/IRX/Expiration date (month/year)

Approval of a vehicle equipped with a multi-evaporator unit or thermal appliance containing an intermediate wall equipped with a thermostatically controlled fan shall be indicated by the letter X. This shall serve as a reminder to the carrier that cold production is not self-contained in each compartment and alternates from one evaporator to another as required, within the limits of the maximum available refrigerating capacity.

MODEL NO. 11

TEST REPORT

prepared in conformity with the provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage (ATP)

Test Report No. .....

Determination of the effective refrigerating capacity of a multi-evaporator refrigeration unit in accordance with paragraphs 65 and 66 of ATP annex 1, appendix 2

Approved testing station

Name: .....

Address: .....

Refrigeration unit presented by:

Name: .....

Address: .....

(a) TECHNICAL SPECIFICATIONS OF THE UNIT

Date of manufacture: .....

Make: .....

Type: .....

Serial No. .....

Category (1)

Unit (1) Two or three evaporators
Self-contained/not self-contained
Removable/not removable
Single unit/assembled components

DESCRIPTION:

.....

.....

.....

.....

COMPRESSOR:

Make: ..... Type: .....

Number of cylinders..... Cubic capacity: .....

Nominal speed of rotation: .....rpm (thermal)
..... rpm (electrical)

METHODS OF DRIVE (1): Separate internal combustion engine, electric motor, vehicle engine, vehicle motion

COMPRESSOR DRIVE MOTOR: (See notes 1 and 2)

INTERNAL COMBUSTION ENGINE:

Make: ..... Type .....

Number of cylinders: ..... Cubic capacity: .....

Power: .....kW or hp at ... rpm Fuel: .....

ELECTRICAL:

Make: ..... Type .....

Power: .....kW or hp at ... rpm Supply voltage V

Supply frequency ..... Hz

HYDRAULIC MOTOR:

Make: ..... Type .....

Method of drive: .....

ALTERNATOR:

Make: ..... Type .....

Speed of rotation: (nominal speed given by manufacturer:
(..... rpm
(
(minimum speed: ..... rpm

REFRIGERANT FLUID: .....

Type: .....

Nominal refrigerant fluid charge (kg) .....

Heat exchangers		Condenser	Evaporator I	Evaporator 2	Evaporator 3
Fluid feed			P, S or P, S or I*	P, S or I*	P, S or I*
Make					
Type					
Number of tubes					
Fan pitch (mm)					
Tube: nature and diameter (mm)					
Exchange surface area (m^2)					
Frontal area (m^2)					
Outlet area (m^2)					
FANS	Type				
	Number				
	Number of blades per fan				
	Diameter (mm)				
	Nominal power (W)				
	Rotation speed (rpm)				
	Total nominal output at a pressure of ..... Pa (m^3)				
	Method of drive				

* P = principal, S = secondary, I = independent (1)

EXPANSION VALVE

Evaporator 1 Evaporator 2 Evaporator 3

Make:
Model:
Adjustable/
non-adjustable: (1)

DEFROSTING DEVICE:

AUTOMATIC DEVICE: Make: Type:

SAFETY DEVICE:

HP/LP pressostat: Make: Type:

Compressor-suction refrigerant injection system: (1)

Make: Type: Cut-in temperature: °C

Other:

(b) TEST METHOD AND RESULTS

Heat-balance test method: in two or three room-calorimeters: (1)

Values measured

	Compartment 1	Compartment 2	Compartment 3
Mean surface (m^2)			
U coefficient (watts/K)			
Mean wall temperature (°C)			

Method employed for the correction of the U-coefficient of the room-calorimeter as a function of the mean wall temperature of the room-calorimeter:

.....

.....

Maximum errors of determination of:

U-coefficients of the room calorimeters: .....

effective refrigerating capacity of the unit: .....

(c) CHECKS

Temperature regulator: Setting: +/- .....K Differential: .....K

Functioning of the defrosting device: satisfactory/unsatisfactory (1)

Nominal air flow volume leaving the evaporator (1): (according to standards AMCA 210-85, BS 848, BS 1042, DIN 24163, ISO 55X, NF 10102, NF 36101)

Values measured

	Evaporator 1	Evaporator 2	Evaporator 3
Fan rotation speed (rpm)			
Static pressure (Pa)			
Air flow (m^3/h)			

RESULTS OF MEASUREMENTS AND REFRIGERATING PERFORMANCE

For a mean air temperature at the condenser intake of °C+/1- K

			Evaporator 1					**Evaporator 2**					**Evaporator 3**					**Observations**
E (0) No	N (1) (r/min)	C or PM (2) (1/h, W)	Tmext 1 (3) (°C)	Tmint1 (4) (°C)	Taev 1 (5) (°C)	Wj 1 (6) (W)	Wol (7) (W)	Tmext 2 (8) (°C)	Tmint 2 (9) (°C)	Taev 2 (10) (°C)	Wj 2 (11) (W)	Wo2 (12) (W)	Tmext 3 (13) (°C)	Tmint 3 (14) (°C)	Taev 3 (15) (°C)	Wj 3 (16) (W)	Wo3 (17) (W)	
1																		
2																		
3																		
4																		(*) Possible, Impossible or thermostat-controlled
5																		
6																		

(0) test No.

(1) compressor rotation speed

(2) fuel consumption (litres/hour) of power consumed by electric motor (watts)

(3) mean external temperature of room-calorimeter No. 1

(4) mean internal temperature of room-calorimeter No. 1

(5) air temperature at intake of evaporator No. 1

(6) power of fan heater in room-calorimeter No. 1

(7) effective refrigerating capacity of evaporator No. 1

(8) mean external temperature of room-calorimeter No. 2

(9) mean internal temperature of room-calorimeter No. 2

(10) air temperature at intake of evaporator No. 2

(11) power of fan heater in room-calorimeter No. 2

(12) effective refrigerating capacity of evaporator No. 2

(13) mean external temperature of room-calorimeter No. 3

(14) mean internal temperature of room-calorimeter No. 3

(15) air temperature at intake of evaporator No. 3

(16) power of fan heater in room-calorimeter No. 3

(17) effective refrigerating power of evaporator No. 3

(*) Delete where not applicable

Possibility of heat production at the evaporator for thermostat settings between 0° C and 12° C: yes/no (1)

(d) REMARKS

MAXIMUM REFRIGERATING CAPACITIES INTERPOLATED FOR ATP REFERENCE TEMPERATURES

E No	T1 (°C)	WO1 (W)	T2 (°C)	Wo2 (W)	To3 (°C)	Wo3 (W)	Observations
1	-20		-20		-20		
2	-10		-10		-10		
3	0		0		0		
4	+12		+12		+12		
5	-20		0		+12		(1) Self-contained or non self-contained
6	0		+12		-20		
7	+12		-20		0		

T1: Mean internal air temperature of room-calorimeter No. 1

T2: Mean internal air temperature of room-calorimeter No. 2

T3: Mean internal air temperature of room-calorimeter No. 3

Wo1: Effective refrigerating capacity supplied by evaporator No. 1

Wo2: Effective refrigerating capacity supplied by evaporator No. 2

Wo3: Effective refrigerating capacity supplied by evaporator No. 3

Done at on

Testing official Test station official

(1) Delete where inapplicable

(2) Values provided by the manufacturer

- - - - -