B.R.A.

BRA Refrigerated Display Cabinet Performance Validation Scheme –

Code of Practice

Issue 1 – December 2003

BRITISH REFRIGERATION ASSOCIATION

British Refrigeration Association
Refrigerated Display Cabinet
Performance Validation Scheme

Code of Practice

Validity of Display Cabinet Performance

The validity of performance data for refrigerated display cabinets supplied into the UK market has traditionally relied upon the reputation of the manufacturer & their relationship with End User clients.

The eligibility criteria for the Government's Enhanced Capital Allowance scheme (ECA) has highlighted the requirement for independent validation of manufacturer's performance data.

This document outlines the purpose, principles and working procedures of the BRA validation scheme.

Purpose of BRA Refrigerated Display Cabinet Performance Validation Scheme

The scheme will assist manufacturers to obtain independent validation of their refrigerated display cabinets performance.

Through a common approach to the EN 441 test content and data presentation, an easy comparison of manufacturers published ratings and the independent report can be made.

End Users will have confidence in the performance data.

The scheme will provide BRA members with a cost effective method of complying with the ECA eligibility criteria.

The Scheme

1 Scope

The scheme covers all types of Refrigerated Display Cabinets and is open to ALL members of the British Refrigeration Association.

The scheme will assist members to achieve compliance with the new ECA eligibility criteria by providing a list of 'independent' assessors who are endorsed by BRA to carry out or witness EN441 display cabinet performance tests resulting in validation of O.E.M. data.

All witness tests & documents validated by BRA listed assessors shall follow the code of practice set out within this document, resulting in the data being of the highest practicable credibility.

Performance tests witnessed by a BRA assessor are able to be carried out in a suitable facility of the manufacturer or supplier's choice.

2 Definitions

2.1 **Refrigerated Display Cabinet**
Cabinet cooled by a refrigeration system which enables chilled and frozen foodstuff placed therein for display to be maintained within prescribed temperature limits. Unit can be operated with an external refrigeration plant 'REMOTE' or an internal plant ' INTEGRAL'.

2.2 **TDA**
Total Display Area according to Eurovent/Cecomaf Recommendation for energy consumption evaluation of remote refrigerated display cabinets REC 05.
NOTE: REC 05 is also used to define TDA for integral cabinets.

2.3 **REC (kWh/24hr)**
Refrigeration Electrical Energy Consumption according to Eurovent/Cecomaf Recommendation for energy consumption evaluation of remote refrigerated display cabinets REC 05.

2.3 **DEC (kWh/24hr)**
Direct Electrical Energy Consumption according to Eurovent/Cecomaf Recommendation for energy consumption evaluation of remote refrigerated display cabinets REC 05.

2.4 **TEC (kWh/24hr)**
Total Energy Consumption.
For remote cabinets TEC = REC + DEC
For integral cabinets TEC = DEC

2.5 **M-package temperature class**

Classification of product temperature achieved in a test room climate class 3. Refer to EN441.

2.6 **Cabinet Family**
Classification for refrigerated display cabinet families as per EN441.

2.7 **Internal Fitting type**
Classification for shelf and internal fittings as per Eurovent/Cecomaf .

2.8 **O.E.M.**
Original Equipment Manufacturer .

2.9 **ECA Scheme**
The Enhanced Capital Allowance scheme.

3 Validated characteristics

The following dimensional and performance characteristics shall be validated:

- Total Display Area (TDA)
- Refrigeration Electrical Energy Consumption (REC)
- Direct Electrical Energy Consumption (DEC)
- M-package temperature class

4 Appointment of independent assessors

BRA will endorse selected individuals to carry out or witness manufacturer's tests, for the purpose of performance validation.

The following criteria must be met by any person who wishes to be named on the BRA list of 'Endorsed' Assessors.

4.1 Be totally independent to any current manufacturer or supplier.

4.2 Respect commercial confidentiality.

4.3 Have a working knowledge of EN441.

4.4 Have practical experience of testing retail display cabinets.

4.5 Understand the thermodynamic calculations involved in resultant data manipulation.

4.6 Have a working knowledge of display cabinet controls and test room equipment and monitoring.

4.7 Possess the ability to work in conjunction with cabinet manufacturer test room staff.

The BRA will regularly review the list of endorsed assessors.

Candidates who meet the above criteria are invited to apply to the BRA Cabinet / Coldstore section. Application documents are available upon enquiry.

Formal endorsement will be approved by resolution of the BRA Cabinet and Coldstore Section.

The list of endorsed assessors is available from the BRA upon request.

5 Payment of fees to independent assessors

A common fee for the services of the BRA assessor as set out in section 6, will be agreed between the independent parties and BRA Cabinet and Coldstore Section members.

The agreed fee will apply for each individual test.

Payment of the fee will be made directly between the employing manufacturer and the Assessor (or their company).

Travelling and miscellaneous expenses for each individual test are to be agreed directly between the BRA assessor and the employing manufacturer.

Contact BRA for schedule of agreed fees.

6 Role of the independent assessor

During the test period

The independent assessor will be present at appropriate times during testing of a cabinet. This will include the end of the test period, and also the most onerous trading conditions (e.g. door openings, lights on).

The following are considered the minimum required tasks undertaken by the assessor and apply to tests carried out regardless of facility location.

6.1 Confirm and record:

- Test room location and reference number
- Cabinet model designation.
- Cabinet Family classification.
- Internal fitting type.
- Lighting (where fitted) is operational for 12hr within the 24hr test period.
- Door openings (where applicable) are in accordance with EN441.
- Nightblinds (where fitted) are lowered for 12hr within the 24hr test period.
  NOTE – The inclusion within the ECA scheme of refrigerated display cabinets fitted with nightblinds is under review at time of publication. Nightblinds are included within the ECA scheme under separate identity.

6.2 Check that instrumentation calibration can be traced against independent accredited specialists.

6.2 Verify test packs used for M-pack monitoring are sized and positioned in accordance with EN441 part 5.

6.3 Check that cabinet is loaded with test product and profiled satisfactorily.

6.4 Verify room conditions (airflow, temperature, lighting and humidity) remain constant at Climate Class 3 throughout test period.

6.5 Ensure that refrigerant inlet and outlet conditions are correctly recorded.

6.6 Carry out random tests to prove calibration of data acquisition equipment.

6.7 Request or carry out any other checks relating to the validity of the test.

The above tasks will be carried with a common approach agreed by all endorsed assessors.

After the test period

6.8 Upon conclusion of the test, the assessor will be presented with an electronic file (Microsoft Excel or similar format) as a record of all data collected during the test period.

6.9 The manufacturer shall present the assessor with a completed test report within two weeks of the test. The assessor shall verify data, check thermodynamic calculations and if in agreement, sign the test report.

The issue of a signed test report will conclude the assessors tasks associated with each test.

7 Tolerance of test data

The tolerances stated within EN441 will be applied to all data produced under the BRA scheme.

8 Presentation of independent test data

Data submitted to the ECA scheme will be presented in a common format, ref BRAECA01 as detailed in appendix 1.

Documents will be compiled by the manufacturer or laboratory facility carrying out the test and submitted to the Independent Assessor for approval and signature.

The manufacturer or laboratory facility will provide evidence of the method and data used in thermodynamic calculations. Explanations of the heat extraction rate calculation are shown on documents BRAECA02 and BRAECA03 for guidance (see appendix 1).

The test report document indicates the data fields that must be completed and validated by the Independent Assessor.

Additional fields may be completed for record purposes if appropriate.

It remains the responsibility of the manufacture or supplier to submit the necessary data to the ECA scheme.

9 Performance data for representative models

Only performance data from 'Tested' models will be validated by the BRA scheme.

The onus remains on the manufacturer to provide suitable evidence to the Carbon Trust in order to support their claim in relation to 'Representative' Models.

10 Use of BRA scheme name and documentation

Only validation tests carried out on behalf of members by BRA endorsed personnel operating in accordance with this code of practice will be authorised to use the scheme documentation.

Appropriate action will be taken against fraudulent references to the scheme.

11 Exclusions

The scheme is intended the provide assistance to members in obtaining independent validation of refrigerated display cabinet performance data.

The BRA or their endorsed assessors will not partake in matters directly with the ECA scheme administrators. The onus remains with the manufacturer to provide all necessary documentary evidence to the ECA scheme.

The scheme does not include provision for 'challenge' of data submitted to the ECA scheme.

NOTE- The ECA scheme administrators carry out 'policing' tests as necessary. It is expected that the tolerance on results will be in line with the Eurovent Certification scheme which, at time of publication, are:-

- Product Temp ±1^{o}C
- REC +10%
- DEC for remote +5%
- DEC on integrals +15%
- TDA -3%

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Appendix 1: Presentation of Independent Test Data

BRA - REFRIGERATED DISPLAY CABINET TEST REPORT BRAECA01

Test Date		DIRECT ELECTRICAL ENERGY CONSUMPTION **(DEC) ***		kWh/24
Manufacturer				
Model designation (inc length)		REFRIGERATION ELECTRICAL ENERGY CONSUMPTION **(REC) ***		kWh/24
Family				
Internal fittings (type)		TOTAL ENERGY CONSUMPTION **(TEC) ***		kWh/24
Number of shelves & size				
		TOTAL DISPLAY AREA CALCULATION **(TDA) ***		m^2
TEST DEFINITION				
Test room climate class	ISO 3	TEC/TDA *		
Refrigerant	R404a			
Expansion device		MEASUREMENT OF HEAT EXTRACTION RATE - BRA 1999 METHOD **		
Defrost process		Test duration.		hrs
Control System		Mean value of liquid refrigerant temperature at inlet.		°C
		Mean value of suction refrigerant temperature at outlet.		°C
Night Blinds 12/12 (if applicable)		Total mass of refrigerant.		Kg
Lighting 12/12 (if applicable)		Mean value of refrigerant mass flow rate.		Kg/s
Door Openings 12/12 (if applicable)		Refrigerant enthalpy at liquid inlet condition.		Kj/Kg
		Refrigerant enthalpy at suction outlet condition.		Kj/Kg
TEMPERATURE VALIDATION TEST - EN441-5	°C	Mean value of evaporating temperature.		°C
Highest temperature of warmest test package °C		Heat extraction rate.		kW
Lowest temperature of coldest test package.°C				
Average mean temperature of visible test packages. °C		MEASUREMENT OF HEAT EXTRACTION RATE - EN441 pt12 ***		
Average mean temperature of all test packages.°C		Test duration.		hrs
M Package temperature class achieved		Mean value of liquid refrigerant temperature at inlet.		°C
		Mean value of suction refrigerant temperature at outlet.		°C
		Total mass of refrigerant.		Kg
CONDENSATION TEST - EN441-8		Mean value of refrigerant mass flow rate.		Kg/s
Observation		Refrigerant enthalpy at liquid inlet condition.		Kj/Kg
		Refrigerant enthalpy at suction outlet condition.		Kj/Kg
		Mean value of evaporating temperature.		°C
Comments		Heat extraction rate.		kW
		NOTES		
		* = DEC, REC, TEC TDA & TEC/TDA to be calculated in accordance with REC 05		
		** = Calculation made in accordance with BRA Method and represented in Appendix ref : BRAECA02		
		*** = Calculation made in accordance with EN441 pt 12 and represented in Appendix ref : BRAECA03		
		= Optional Data		
Assessor		Manufacturer		
Name		Name		
Position / Company		Position / Company		
Signed		Signed		
Date		Date		

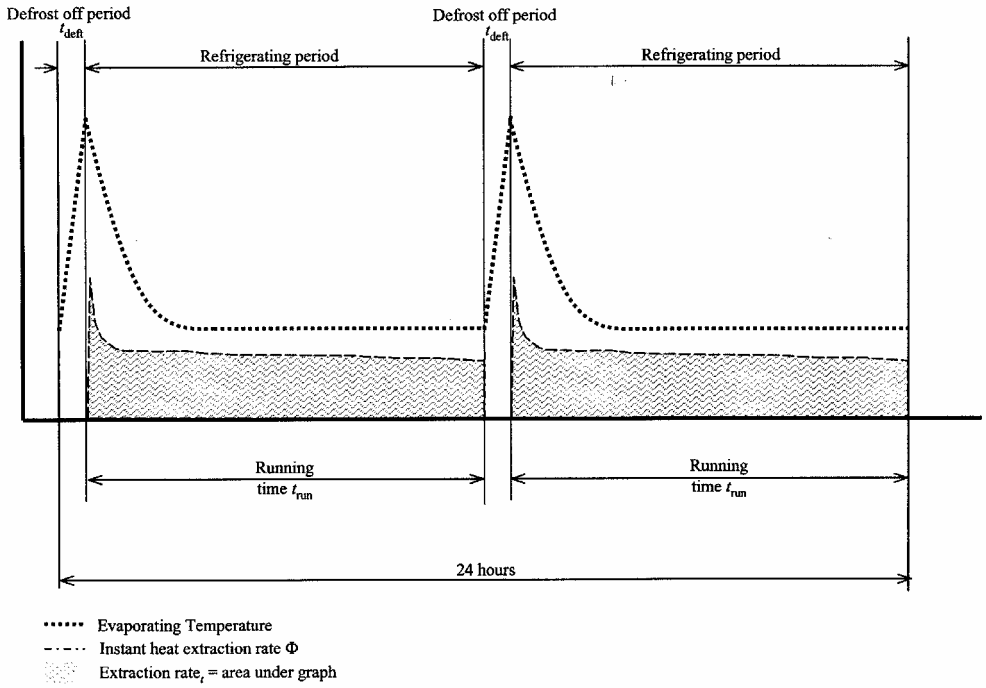
BRA Method of calculating extraction rate

F_{bra}

Extraction rate calculated using massflow averaged over the entire 24 hours (including defrost and pulldown) and enthalpy during running only

(not in prEN441)

Total massflow divided by total time ie.24/24
(t_{run}+t_{stop}+t_{defi})
Average enthalpy difference during whole time between defrosts
(24h-t_{defi})



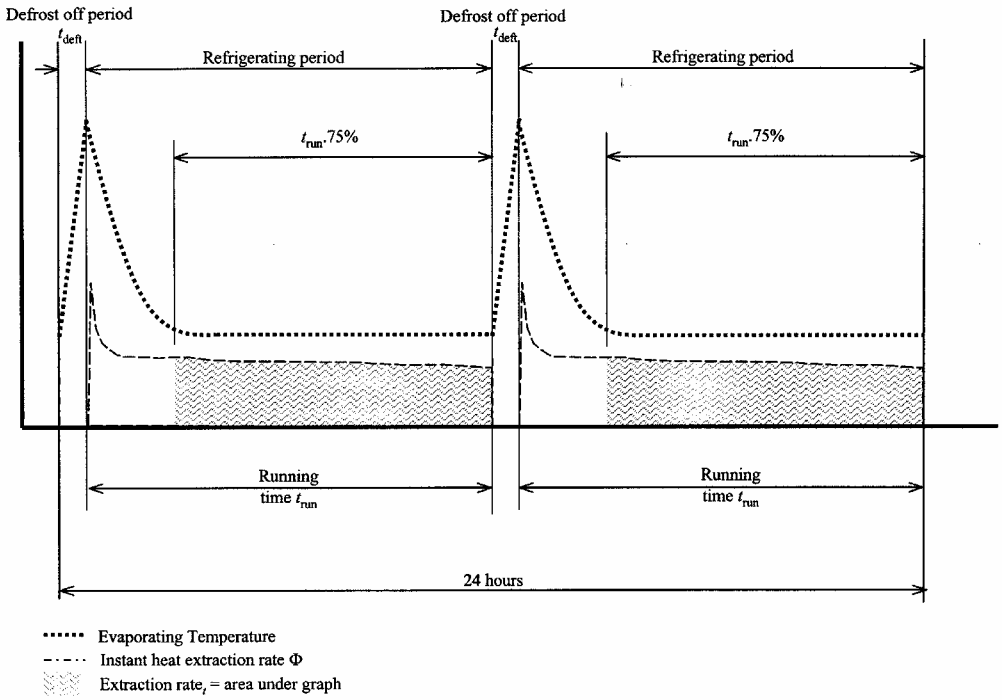
prEN441-2 Method 2

F_{run75}

Extraction rate calculated using F_n summed only over the last 75% of the running time between defrosts {Not applicable if cycling}

(Method used in EN441-12:1997 and for calculation of REC in Eurovent Certification)

Summation of F_n for last 75% of time between defrosts



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