Re/genT Note: 15225 / CE13 / V2	Technical Note
Project	Ecodesign and labelling review Cold
Subject	Product categorisation and correction factors
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1. Introduction

1.1. Document revision history

Release date	*Author*	*Version*	*Remark / document change*
25/5/2015	Martien Janssen	V1	First version for discussion
29/5/2015	Martien Janssen	V2	Updated references and confidentiality removed

1.2. Background

Currently a review process of the energy labelling and ecodesign regulations for cold appliances is ongoing. The consultancy company VHK, the Netherlands, has been instructed by the EU commission to perform an advisory study which should be completed by Oct/Nov 2015.

CECED WG Cold has presented a proposal for a complete revision of the current product categories, correction factors and bonuses. This proposal is outlined in Re/genT note 15116 / CE12 / V6 and has been presented to VHK. Within this proposal a number of new product categories have been defined for built-in products.

This note aims to further identify differences between built-in and stand-alone appliances and to support the request for separate built-in product categories.

2. Built-in products

2.1. Introduction

Currently a correction factor is used for built-in products. The reasoning is based on the fact that the product offers an additional feature, namely the fact that it is designed for the more severe conditions in a built-in situation. As the product is also tested under these more severe conditions a higher energy consumption is declared compared to a stand-alone product of the same volume and the same technological level. A stand-alone product will be tested under free-standing condition; if it will be placed in a niche it will use more energy than what would be expected from the declared energy. To correct for this anomaly, correction factors or other measures can be used.

2.2. Relevance of built-in products in the cold appliance industry

From the CECED database 2013 it has been derived that 29 % of the products are built-in with 93 % having a width of 58 cm or smaller, fitting in the typical standard kitchen cabinet of 60 cm.

In particular for European cold appliance manufacturers this is an important market segment and European manufacturers have been leading in this field for years. In combination with the kitchen manufacturer industry this results in significant employment.

2.3. Built-in constraints

The kitchen industry has defined very strict limits and is not open for change with respect to these limits. Generally the width must not exceed 58 cm and also the depth is not allowed to exceed 56.5 cm.

This limits the options for reducing energy use compared to stand-alone appliances where in general a trend has been observed in increasing the insulation thickness. This in fact drives the industry to use more advanced (and more expensive) cooling technology systems and the built-in products in fact drive the innovation.

Even for wider niche sizes as 60 cm, the same effect remains present as increase of outer dimensions is not an option, while this is the case for stand-alone appliances having the same internal volume.

Where for stand-alone products insulation increase can also be compensated with increased product height to maintain the same storage volume, this is less the case for built-in product. Normally these are placed above floor level limiting the options for height increase due to accessibility.

2.4. Impact of built-in on energy consumption

Products designed for built-in take into account the circumstances prevailing in such conditions, such as limited access of ventilation. Such products are tested under these conditions so that the energy consumption declared is already more than if the same product would be tested under stand-alone conditions.

This is quite different than if a stand-alone product is placed inside a niche. Figure 1 represents test results obtained on 3 different product types. In all cases a reference measurement was taken under free standing conditions as prescribed in the test standard. Next the products were placed in a niche with spacing dimensions as shown on the x-axis.

It is concluded that the energy consumption increase depends on the type of product, but is in any case significant (at least 6.5 %).

As defined in the test standard, built-in appliances are tested under more severe conditions than a free-standing product. A specific casing is used which allows air passages at the bottom and back side according the minimum specified built-in instructions of the manufacturer. This means that the measured consumption is the worst case scenario and that any built-in appliance already consumes more during the test than it would do if tested as a stand-alone product.

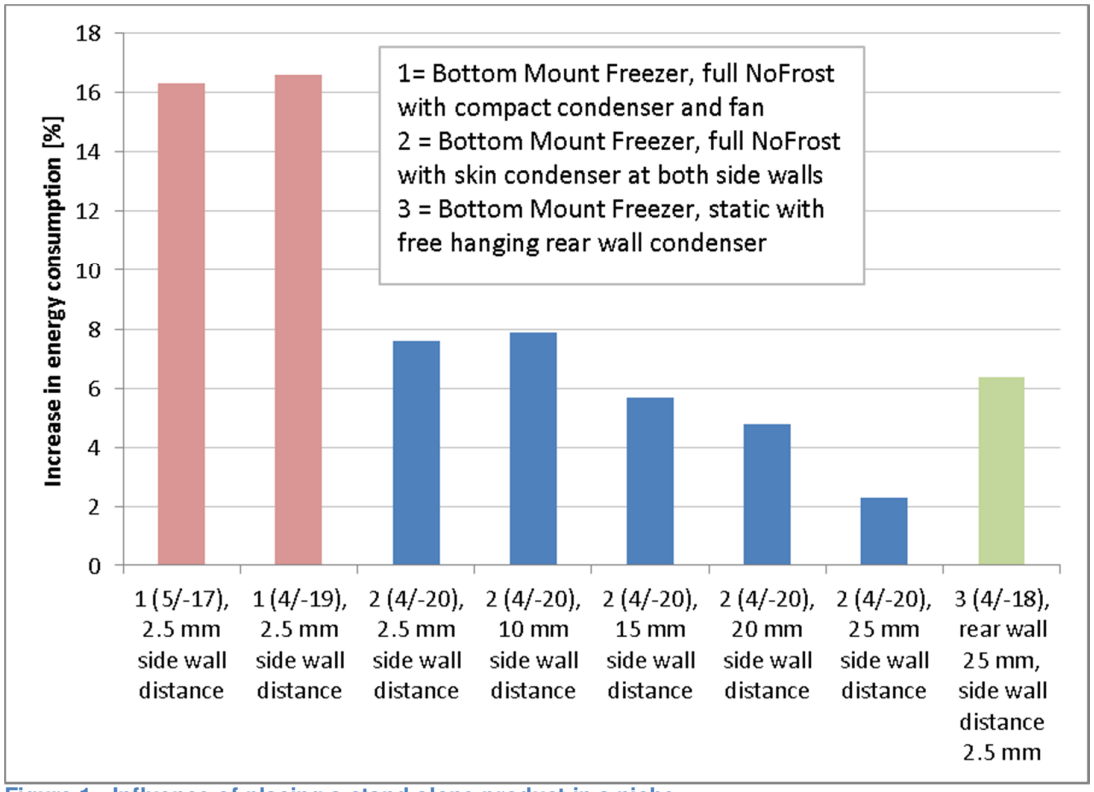

Figure 1 : Influence of placing a stand-alone product in a niche

2.5. Market impact

Though this may not be so obvious at first sight, built-in products drive the market into the direction of smaller inner volumes. This is a direct consequence of the limitations on the outer dimensions, which cannot be compensated for. It is estimated that the average inner volume of built-in appliances sold on the market is approximately 30 % smaller than for free standing appliances This actually leads to a reduction of the total energy consumption of cooling appliances in Europe.

Figure 2 shows the distribution of cold appliances CECED database 2013 for refrigerators, refrigerators/freezers and upright freezers respectively. For all categories the built-in sizes are generally smaller than for the stand-alone products.

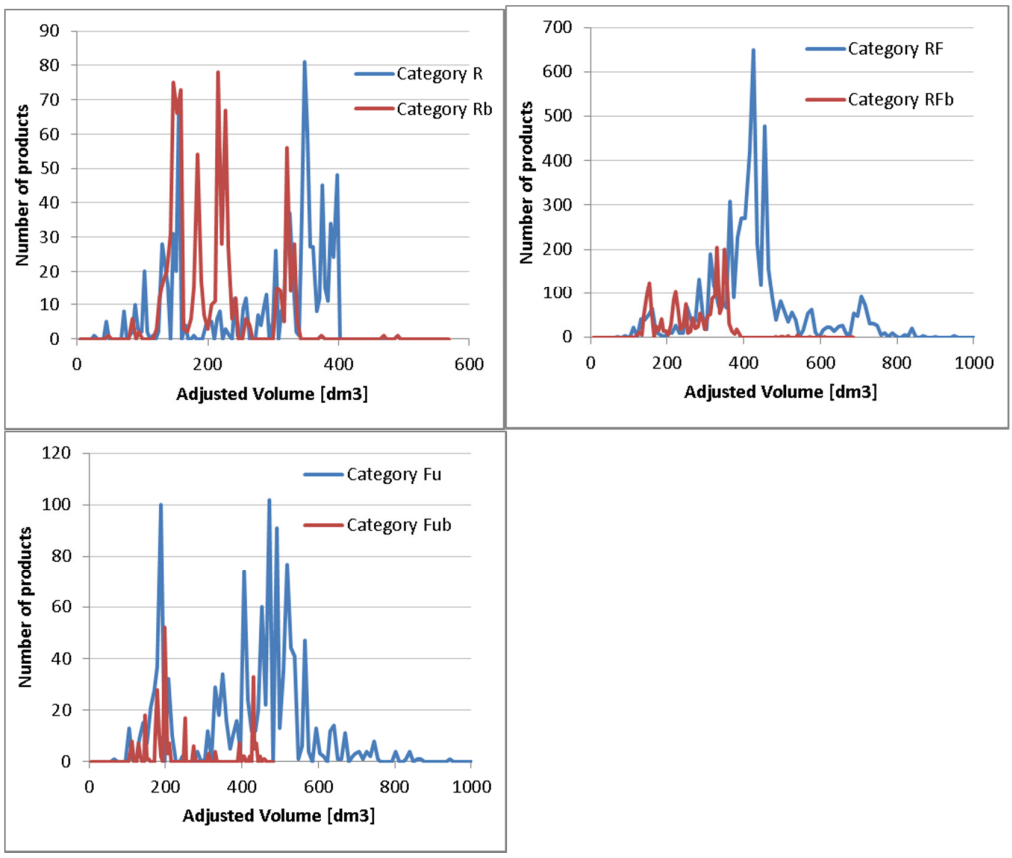

Figure 2 : Distribution of products in the CECED database 2013 (R = Refrigerators, RF = Refrigerator/Freezers, Fu = Upright Freezers, b = built-in)

2.6. Options for differentiations between stand-alone and built-in

Currently, products that are built-in and have a width of less than 58 cm receive a volume correction factor of 1.2. The impact of such factor on the allowed energy consumption differs per product category and depends on the product size as is shown in Figure 3. There are in fact no technical arguments for these differences.

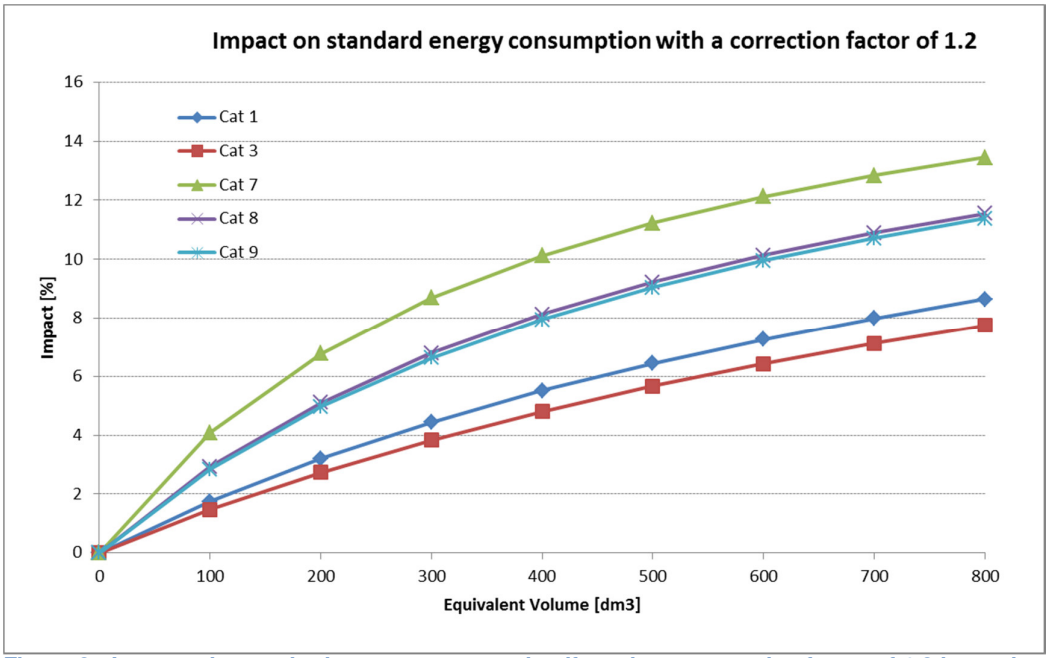

Figure 3 : Increase in standard energy consumption if a volume correction factor of 1.2 is used

As an alternative built-in could be handled through a fixed compensation on the standard energy consumption, which would eliminate the volume dependent character of the current correction factor, which in fact privileges large appliances.

A third method as included in the CECED proposal is to create different product categories which eliminates the need of technical comparisons between built-in and stand-alone. This is intrinsically difficult as products with exact same technological level in a built-in and free standing version are difficult to define. In general the consumer purchase decision for built-in or stand alone is not driven by the efficiency class, so treatment in the same category is not a necessity. Further placing built-in in different categories makes it easier to identify those products then using a more or less hidden parameter in the calculation process.

2.7. International developments

Within the cold appliance energy regulation of the US different categories have been formulated for built-in versus stand alone. Figure 4 presents differences between stand-alone products and built-in. The difference is volume independent and ranges from app 6 to 17.5 % depending on product category.

For the new Chinese cold appliance Energy Regulation which will be active in 2015, built-in is introduced by means of a volume correction factor of 1.2, in fact the same factor as in the current European regulation.

bottom mount			
AV [cbft]	product class 5	product class 5BI	difference stand alone/BI
5	325,15	345,5	5,9%
5,5	329,135	349,73	5,9%
6	333,12	353,96	5,9%
6,5	337,105	358,19	5,9%
7	341,09	362,42	5,9%
7,5	345,075	366,65	5,9%
8	349,06	370,88	5,9%
8,5	353,046	375,11	5,9%
9	357,03	379,34	5,9%
9,5	361,015	383,57	5,9%
10	365	387,8	5,9%
10,5	368,985	392,03	5,9%
11	372,97	396,26	5,9%
11,5	376,955	400,49	5,9%
12	380,94	404,72	5,9%
12,5	384,925	408,95	5,9%
13	388,91	413,18	5,9%
13,5	392,895	417,41	5,9%

upright freezer			
AV [cbft]	product class 9	product class 9BI	difference stand alone/BI
5	244,3	279,15	12,5%
5,5	248,18	283,595	12,5%
6	252,06	288,02	12,5%
6,5	255,94	292,466	12,5%
7	259,82	296,89	12,5%
7,5	263,7	301,325	12,5%
8	267,58	305,76	12,5%
8,5	271,46	310,195	12,5%
9	275,34	314,63	12,5%
9,5	279,22	319,066	12,5%
10	283,1	323,5	12,5%
10,5	286,98	327,935	12,5%
11	290,86	332,37	12,5%
11,5	294,74	336,805	12,5%
12	298,62	341,24	12,5%
12,5	302,5	345,675	12,5%
13	306,38	350,11	12,5%
13,5	310,26	354,546	12,5%

side mounted refrigerator freezer			
AV [cbft]	product class 7	product class 7BI	difference stand alone/BI
5	418,35	506,85	17,5%
5,5	422,195	511,465	17,5%
6	426,04	516,08	17,4%
6,5	429,885	520,695	17,4%
7	433,73	525,31	17,4%
7,5	437,575	529,925	17,4%
8	441,42	534,54	17,4%
8,5	445,265	539,155	17,4%
9	449,11	543,77	17,4%
9,5	452,955	548,385	17,4%
10	456,8	553	17,4%
10,5	460,645	557,615	17,4%
11	464,49	562,23	17,4%
11,5	468,335	566,845	17,4%
12	472,18	571,46	17,4%
12,5	476,025	576,075	17,4%
13	479,87	580,69	17,4%
13,5	483,715	585,305	17,4%

Figure 4: US Energy regulation, difference built-in versus stand alone for 3 different products.

2.8. Misuse of built-in categories

As built-in categories would have higher energy reference lines (or would have a compensation), a misuse is possible and should be avoided. In all cases it should be avoided that products can be sold as built-in while the energy use is measured and declared in a free standing condition.

Currently the built-in correction factor is limited to products with a width of < 58 cm. There is no real technical argument for this differentiation. This limit has mainly been introduced to avoid misuse of the correction factor, in particular to avoid that large appliances are sold as built-in while at the same time these are suitable to be used as stand-alone. This risk can also be mitigated by a better definition of built-in. A suitable definition has been copied from the US energy standard but with some modifications to further strengthen the definition:

Built-in appliance:
Any appliance that is designed, intended, tested[1] and marketed exclusively
(1) to be installed totally encased (top, bottom, sides and back)[2] by cabinetry or panels that are attached during installation,
(2) to be securely fastened to the sides, top or floor of the cabinetry[3] and
(3) to either be equipped with an integral factory-finished face or accept a custom front panel.

Note that this definition is more limiting than the definition in IEC62552-1:2015, so inclusion of the definition above in the regulation (or in the EN62552 update) is required to avoid any misuse of the built-in categories. Further, when a product is defined according the above definition and placed in a category "***b***"', then by definition the product must be tested as a built-in which means that its measured energy consumption will increase compared to a stand-alone measurement.

[1] *The word testing has been added to support the claim for the **b** category and promote importance to this differentiation.*
[2] *The definition of encased has been added, requiring that the product should be covered at all surfaces except the door.*
[3] *Fastening has been defined as fastening to the cabinetry, so that e.g. only fixing on the back kitchen wall is not sufficient, as this would still allow some margin to declare a stand-alone product inside the category **b***

In fact, the placement of all built-in products in separate categories rather than a treatment with correction factors, makes it easier to detect any incorrect usage, which is another argument for having separate categories rather than correction factors or compensations.