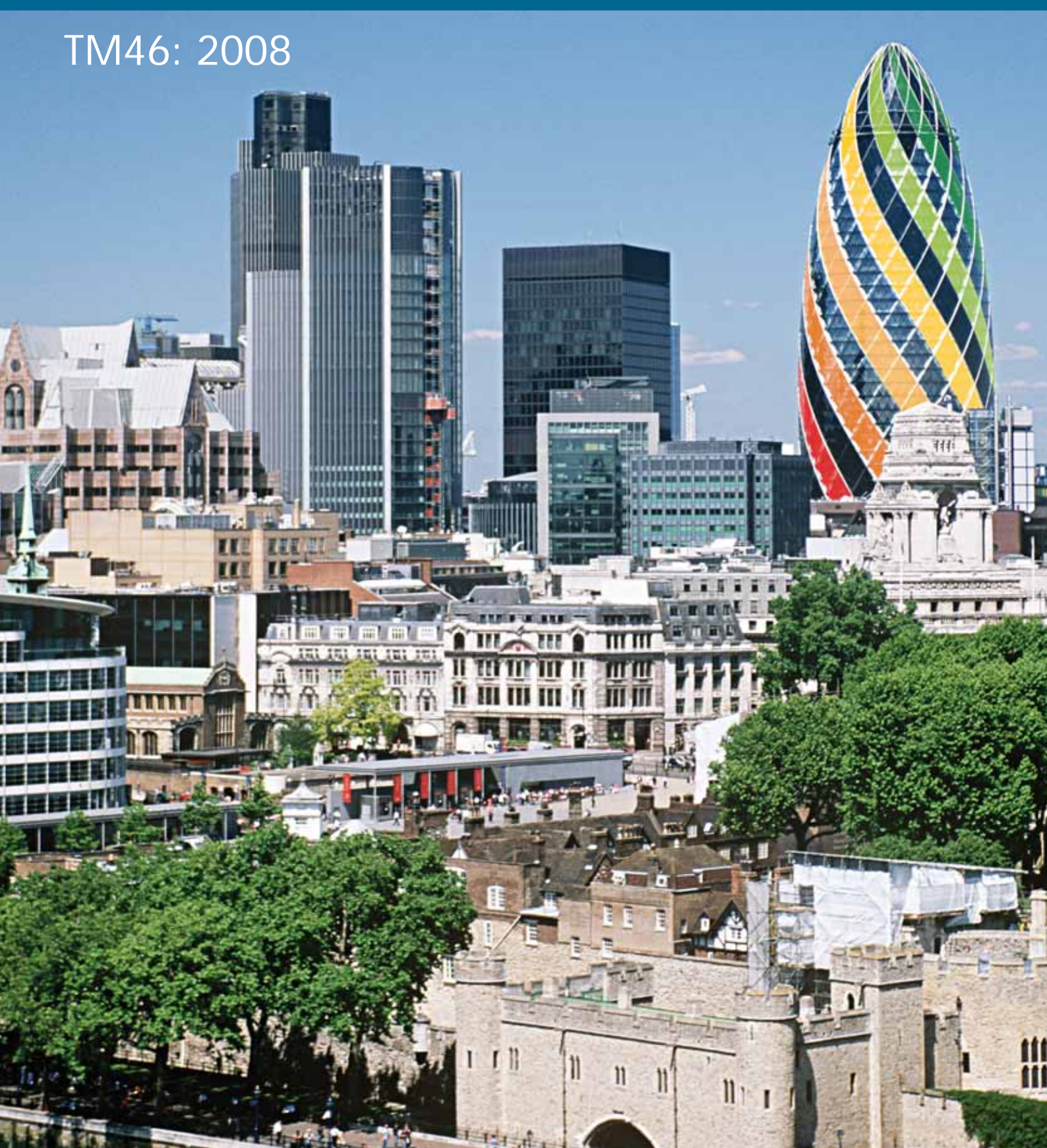


Energy benchmarks



TM46: 2008



Energy benchmarks

CIBSE TM46: 2008



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Note from the publisher

This publication is primarily intended to provide guidance to those responsible for the design, installation, commissioning, operation and maintenance of building services. It is not intended to be exhaustive or definitive and it will be necessary for users of the guidance given to exercise their own professional judgement when deciding whether to abide by or depart from it.

Foreword

Building management is becoming more important and more demanding. There is growing pressure on the engineers responsible for the operational management of buildings to provide not only high quality engineering services, but to run and manage them as economically and efficiently as possible.

The EU Energy Performance of Buildings Directive (EPBD), implemented via changes to Part L of the Building Regulations in 2006 and through the Energy Performance of Buildings Regulations in 2007, has had a significant effect in this regard. It introduces requirements for energy certification of buildings and inspection of air conditioning systems. The Regulations are intended to encourage owners and tenants to choose energy efficient buildings when seeking new accommodation, as well as improving the performance of the buildings they already occupy.

Whilst Energy Performance Certificates (EPCs) show prospective building owners and tenants the potential performance of a building, they do not take account of the energy used to operate the building.

Display Energy Certificates (DECS) are intended to provide information to operators of larger public buildings about how well they are actually being run, based on metered energy consumption data. These certificates will be displayed for all visitors to see, thereby making the performance of the public building stock more open and transparent to all.

Performance management is all about tracking performance and identifying opportunities for improvement. This relates not only to past performance but also how current performance compares with other buildings, especially those of similar type. CIBSE published good practice guidance on energy efficiency in buildings in 1997, including a comprehensive set of energy benchmarks for buildings. Energy Consumption Guide 19, *Energy use in offices*, was first published in 1995 and reprinted in 2000, and addressed the office sector. The data in these benchmarks has been updated for use in support of the requirements for display energy certificates.

The benchmark data contained in this TM are based on the original CIBSE Guide F and ECG 19 data, updated to take account of more recent additions to the data set. The number of categories has been substantially reduced, both for ease of allocation and to reduce the scope for poorly performing buildings to be placed in more advantageous categories. It is hoped that the focus of attention will be on improving actual performance, which will reduce carbon emissions and save public funds, rather than a debate about the benchmarks. The data will be reviewed as they are used for the production of certificates, and will be revised as appropriate in the future. In the meantime, it is CIBSE's intent that as energy use in buildings is measured better, so it will be better managed.

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Contents

1	Introduction	1
2	Benchmarking approach	1
2.1	Annual consumption period	1
2.2	Separable energy uses	2
2.3	Adjustments to benchmarks	2
2.4	Mixed use buildings	2
3	Description of the benchmarks table	2
	References	3
	Appendix A1: Weather adjustment	13
	Appendix A2: Separable energy uses	14
	Appendix A3: Occupancy adjustment	17
	Appendix A4: Notes on specific building types	18

Energy benchmarks

1 Introduction

This document describes the statutory building energy benchmarks prepared to complement the Operational Rating procedure developed by the Department for Communities and Local Government (CLG) for Display Energy Certificates for use in England, Wales and Northern Ireland under the The Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007 (as amended)⁽¹⁻⁴⁾ and the The Energy Performance of Buildings (Certificates and Inspections) Regulations (Northern Ireland)^(5,6).

It describes the benchmarks and explains the approach to their development and use. The principles of Operational Ratings, Display Energy Certificates and the Advisory Reports that accompany them are set out in CIBSE TM47⁽⁷⁾.

Display Energy Certificates show a grade on an A to G scale, based on the operational rating. This is the ratio of actual building carbon dioxide emissions based on real energy consumption data to benchmark emissions for a typical building of that category. These certificates must be displayed at all times, in a prominent position, by larger public buildings over 1000 m², after 1st October 2008 in England and Wales, and from 31st December 2008 in Northern Ireland*.

Display Energy Certificates are required for buildings with a total useful floor area greater than 1000 m², that are occupied by a public authority or an institution providing a public service to a large number of people, and are frequently visited by members of the public. They are valid for one year. They must be accompanied by an advisory report, setting out advice on measures that could be taken to improve the energy performance of the building, which is valid for 7 years. Display Energy Certificates must be produced by accredited Energy Assessors who are members of a scheme approved by the Department of Communities and Local Government.

CIBSE developed initial proposals for the benchmarks based on chapter 20 of CIBSE Guide F: *Energy efficiency in buildings*⁽⁸⁾ and Energy Consumption Guide ECG19: *Energy efficiency in offices*⁽⁹⁾. These were presented and discussed at a specially convened workshop at the end of July 2007. Following responses at that meeting a revised benchmark set was circulated in September 2007 for comment to 80 individuals in 40 public and private sector organisations with an interest in Display Energy Certificate benchmarking. As a result of this consultation

further discussions were held and refinements made to the benchmark set.

2 Benchmarking approach

The following principles set down by the CLG steering committee for Operational Ratings, and adopted by the CIBSE Benchmarking Steering Group, form the basis for the statutory operational rating and benchmarking procedures developed to implement the Energy Performance Regulations.

- *Benchmark categories:* There are currently 29 benchmark categories, as set out in Table 1. Each category represents a major functional group of buildings, so the benchmarks provide an indication of how a building is performing in relation to the wider group. An example is offices, where there is no differentiation for servicing strategy, so that a fully air conditioned office shares the same benchmark as a naturally ventilated office. Other sectors follow this approach. Table 2 sets out how buildings are allocated to the 29 benchmark categories. The categories and classifications will be kept under review as statistical data from DEC's are collected.
- *Benchmark values:* The benchmarks are expressed in terms of delivered energy used per unit of floor area (kW·h/m²), for both electrical and fossil fuel energy use, as set out in Table 1. For operational rating purposes they are converted to carbon dioxide emissions per unit area (kgCO₂/m²) using defined CO₂ intensity factors for electricity and (where present) fossil-thermal energy, which is taken to be gas. The conversion factors are defined separately by CLG and applied by the software and are therefore not part of this benchmark set (because the benchmarks are specified in energy terms) although illustrative values are provided in Table 3.

2.1 Annual consumption periods

The energy use of the building is ideally measured over a period of exactly 365 days. The actual metered consumption is adjusted to 365 days if the actual period between readings differs slightly, with a maximum variation of plus or minus 31 days permitted. This adjustment is not a benchmark issue but is part of the calculation procedure.

Where the energy is not directly metered, e.g. fuel oil, coal or wood, then the assessor will need to review delivery

* In Scotland, larger public buildings will be required to publicly display an Energy Performance Certificate from 4th January 2009

records and check inventory levels to calculate annual consumption figures.

2.2 Separable energy uses

The annual metered consumption data for the building can also be reduced if there is validated metered energy consumption for one or more of the allowed separable energy uses. These are listed in Appendix A2, Table A2.1. This appendix provides further information on separable energy uses. The actual energy use of the building is not adjusted other than for the consumption period (see section 2.1) and for any separable energy uses).

2.3 Adjustments to benchmarks

Two adjustments to the benchmark may be made:

- *Weather adjustment:* To improve the accuracy of operational ratings the benchmark is adjusted for weather. The weather adjustment is automatically carried out within the approved software, using the relevant degree-day data for the assessment period.
- *Occupancy adjustment:* Buildings which are occupied for long periods are likely to use more energy than those occupied for shorted periods. Where valid and verifiable data for occupancy duration is available, the benchmark may be adjusted. The occupancy adjustment is carried out within the software if the assessor enters confirmed annual occupied hours greater than the standard values for the benchmark building as set out in Table 1.

2.4 Mixed use buildings

Mixed use buildings may be split into their component uses for separate assessment of each type of use. Otherwise, a composite benchmark based on the relative percentage of total usable floor area allocated to each use may be calculated. For example, for a building having 1200 m² of general retail and 1800 m² of hotel, the retail element comprises 40% of the total floor area and the hotel 60%. A composite benchmark will therefore be calculated by adding 40% of the retail benchmark to 60% of the hotel benchmark. This approach also applies where buildings include conditioned car parks, restaurants, or swimming pools which can be specified by floor area.

3 Description of the benchmarks table

Table 1 is the main benchmark table. For each of the 29 benchmark categories, the table contains the following data:

- Column A: category number
- Columns B–C: category name and description
- Columns D–F (Table 1(a)): allocation guides, which show how a building may be allocated to

the sector, under headings of space usage, operating schedule and distinguishing features.

- Columns G–J (Table 1(a)): further details of the category including:
 - building services included in the energy benchmarks (the list is not exhaustive)
 - other benchmark categories which may be found in combination with the current category; e.g. ‘dry sports’ and ‘swimming pool’ categories may be present in the same sports complex; also office space and covered car parking often co-exist within one metered building
 - separable energy uses which may be deducted (if separately metered) in the benchmark comparison for this category, e.g. sports floodlighting
 - representative buildings: examples of buildings which fall in this category.
- Columns K–L (Table 1(b)): the energy benchmarks expressed as kW·h/m² for electricity and for fossil-thermal energy.
- Columns M–O (Table 1(b)): CO₂ benchmarks obtained from the energy benchmarks, expressed as kgCO₂/m² for the two fuels and the total. These are calculated from the energy benchmarks with the CO₂ intensity factors shown in Table 3 and are illustrative and not to be considered as fundamental benchmark data.
- Columns P–R (Table 1(b)): the building size measurement or metric; generally the building is to be measured as gross floor area (the gross internal area (GIA) as defined by the Royal Institution of Chartered Surveyors (RICS)), but in some sectors other ‘alternate’ metrics are also allowed such as net lettable area for offices. In these cases a default factor to convert to the GIA is provided for use by the software if the user has only the alternate data.
- Columns S–T (Table 1(c)): the weather adjustment data comprises a stated percentage, for electricity and for fossil-thermal, indicating what fraction of that energy source is to be scaled by the degree-day value. See Appendix A1 for further information on weather adjustment and degree-days.
- Column U (Table 1(c)): the list of separable energy uses allowed for each category; no other energy uses can be subtracted from the metered energy use. Further conditions must be satisfied before these separable energy uses can be subtracted, as specified in Appendix A2, Table A2.1. See Appendix A2 for further information on separable energy use.
- Columns V–Z (Table 1(c)): occupancy adjustment is handled by defining an annual total of occupied hours for the building and comparing this to the expected value as stated in the benchmark table (‘benchmark hours per year’) for the category. Any increase in hours leads to an increase in the benchmark values up to the maximum increase specified in the tables — intermediate values are prorated. See Appendix A3 for further information on occupancy adjustment.

Table 1 follows on pages 4 to 9. Table 2, see pages 11 to 13, provides a list of building types showing their allocation to the proposed benchmark categories.

References

- 1 The Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007 Statutory Instruments 2007 No. 991 (London: The Stationery Office) (2007)
- 2 The Energy Performance of Buildings (Certificates and Inspections) (England and Wales) (Amendment) Regulations 2007 Statutory Instruments 2007 No. 1669 (London: The Stationery Office) (2007)
- 3 The Energy Performance of Buildings (Certificates and Inspections) (England and Wales) (Amendment No. 2) Regulations 2007 Statutory Instruments 2007 No. 3302 (London: The Stationery Office) (2007)
- 4 The Energy Performance of Buildings (Certificates and Inspections) (England and Wales) (Amendment) Regulations 2008 Statutory Instruments 2008 No. 647 (London: The Stationery Office) (2008)
- 5 The Energy Performance of Buildings (Certificates and Inspections) Regulations (Northern Ireland) 2008 Statutory Rules of Northern Ireland 2008 No. 170 (London: The Stationery Office) (2008)
- 6 The Energy Performance of Buildings (Certificates and Inspections) (Amendment) Regulations (Northern Ireland) 2008 Statutory Rules of Northern Ireland 2008 No. 241 (London: The Stationery Office) (2008)
- 7 *Operational ratings for Display Energy Certificates* CIBSE TM47 (London: Chartered Institution of Building Services Engineers) (2008)
- 8 *Energy efficiency in buildings* CIBSE Guide F (London: Chartered Institution of Building Services Engineers) (2004)
- 9 *Energy efficiency in offices* Energy Consumption Guide ECG 19 (The Carbon Trust) (2003) (available at <http://www.carbontrust.co.uk/Publications>) (accessed August 2008)

Table 1 is shown on pages 4 to 9

Table 2 is shown on pages 11 to 12

Table 1 Benchmark categories and values; (a) allocation guides and further category details

[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	
Name and description			Allocation guides				Further category details			
Category	Name	Brief description	Space usage	Operational schedule	Distinguishing features	Services included	May be part of mixed use with areas below	Summary of allowable special energy uses	Representative buildings	
1	General office	General office and commercial working areas	Mainly by employees, for sedentary desk based activities. Includes meeting and conference facilities.	Weekdays and early evenings	Relative uniformity of occupancy, density, conditions, schedule and appliances	Heating, lighting, cooling, employee appliances, standard IT, basic tea room	Covered car park, staff restaurant	Regional server room, trading floor	General office benchmark category for all offices whether air conditioned or not, Town Halls, architects, various business services that do not include retail functions	
2	High street agency	High street agency	By employees mainly for desk based activities and off street visitors — public area and back office	Weekdays and early evenings, commonly part or all of weekend	Office type of activities, with retail street frontage, and consequent infiltration and glazing losses	Heating, lighting, cooling, employee appliances, standard IT, basic tea room			Bank branches, estate agents, travel agents, legal, insurance and advertising services, off-street professional services, Post Offices, betting shops	
3	General retail	General street retail and services	Mainly by clients, customers and visitors for a service activity — some facilities required for employees	Weekdays and early evenings, commonly part or all of weekend	Basic heating, lighting, cooling for off street premises that may contain a wide variety of activities besides sale of goods	Heating, lighting, cooling, appliances for small number of employees			High street store or local stores. Corner shops, amusement arcades, takeaways, hairdressers, laundries, laundrettes, dry cleaners, hire premises, indoor markets	
4	Large non-food shop	Retail warehouse or other large non-food store	Mainly by customers for purchasing goods — some facilities required for employees	Typically week and weekend days	Large, and tends to be solely used for retailing	Heating, lighting, cooling, number of employees			Retail warehouses or shed, department stores, hypermarkets, large showrooms	
5	Small food store	Small food store	Mainly by customers for purchasing goods — some facilities required for employees	Typically week and weekend days	Greater needs for refrigeration of goods than other shops	Heating, lighting, display cabinets, food storage, employee appliances			Food stores, green grocers, fish shops, butchers, delicatessens	
6	Large food store	Supermarket or other large food store	Mainly by customers for purchasing goods — some facilities required for employees	Typically week and weekend days; may be used in evenings, some are 24/7 operations	Greater needs for refrigeration of goods, and larger, than other shops	Heating, lighting, display cabinets, food storage, employee appliances	Covered car park	Bakery oven	Supermarkets and freezer centres	
7	Restaurant	Restaurant	Storage and preparation of food which is then cooked and served to users; seating space for eating is provided	There is a wide variety of operational schedules, from selected portions of weekdays to 24/7 operation	Assumes minimal reheating of food.	Heating, lighting, cooling, food storage, heating of pre-prepared food		Cooking equipment in a catering kitchen	Cafes, restaurants, canteens, refectories, mess halls	
8	Bar, pub or licensed club	Bar, pub or club	Serving drinks and snacks, with standing and sitting areas for customers	Open to public or members, day and evening	Major activity is the bar and associated areas	Heating, lighting, cooling, some office appliances, snack provision			Pubs licensed clubs, members clubs, wine bars	
9	Hotel	Hotel or boarding house	Primarily the provision of short term accommodation and hygiene facilities	Primarily used in evenings	Provision for paid short term accommodation	Heating, lighting, cooling, some office appliances, laundry services	Swimming pool, fitness and health centre, restaurant, general office (for conference facility)		All hotel types, guest houses, motels	
10	Cultural activities	Museum, art gallery or other public building with normal occupancy	Spaces for displaying and viewing objects, with associated office and storage facilities	Daytime use, similar to office hours but more likely to be open in weekends	Activity is office like in its requirements but with some additional conditioning requirements for display and storage of artefacts	Heating, lighting, cooling, humidity control			Municipal museums, libraries and galleries, higher education arts buildings	
11	Entertainment halls	Entertainment halls	Large assembly and seating areas, with associated ticketing and snack services, for performance events and films	Mainly in evenings, some daytime use. All days of week	Tend to be large halls, mainly used in evenings	Heating, lighting, cooling of main entertainment spaces, and circulation. Ticketing and snacks provision			Cinemas, theatres, concert halls, Bingo halls	
12	Swimming pool centre	Swimming pool hall, changing and ancillaries	Swimming pool with associated facilities	Ranges from occasional use to daily and evening	Pool hall is the dominant space use — may have small café and fitness room	Heating, lighting, cooling of all spaces. Office appliances, showers, snack provision and bar			Swimming pool centre without further sports facilities	
13	Fitness and health centre	Fitness centre	Fitness, aerobics, dance and solarium/sauna facilities	Typically daily and evenings	Provision of sports and entertainment equipment with generally high energy usage, and internal gains	Heating, lighting, cooling of all spaces. Office appliances, showers, snack provision and bar			Fitness centre, health centre	
14	Dry sports and leisure facility	Dry sports and leisure facility	Dry sports and club house buildings — for a combined leisure centre include pool etc.	Ranges from occasional use to daily and evening	Provision of space to support separated sporting and entertainment activities often lightly serviced	Heating, lighting and basic office equipment	Swimming pool, fitness and health centre	Sports flood lighting	Dry sports halls, sports grounds with changing rooms, tennis courts with office, speedway tracks, stadiums, pavilions	
15	Covered car park	Car park with roof and side walls	Provision for car parking and access	Weekday or 24-hour	Lighting and mechanical ventilation when in use.	Lighting and ventilation	Office, public building in central urban location			

Benchmarks table

16	Public buildings with light usage	Light use public and institutional buildings	Variety of facilities and services provided with generally public access when in use	Intermittent usage	Lightly serviced or lightly used	Heating and lighting			Churches, clubs houses, village halls
17	Schools and seasonal public buildings	Public buildings nominally used for part of the year	Teaching and community activities	Weekday usage for part of the year	Public buildings with part annual occupancy	Heating, lighting and basic office equipment, teaching equipment, computers	Restaurant (dining hall), swimming pool		Primary and secondary schools, nurseries, creches, youth centres and community centres
18	University campus	University campus	Lecture theatres, offices, workshops, eating places, laboratories and other activities	Weekdays and evenings	Large floor space and variety of activities	Heating, lighting, cooling, office and teaching equipment	Laboratory, restaurant	Furnace or forming process	Typical campus mix for further and higher education universities and colleges
19	Clinic	Health centres, clinics and surgeries	Provision of primary health care	Usually week days and early evenings	Daytime use, essentially office hours, but needs to provide for high public use, generally by appointment	Heating, lighting, cooling, hot water services			Doctors surgeries, health clinics, veterinary surgeries, dentist
20	Hospital; clinical and research	Clinical and research hospital	Mainly space for medical care with 24-hour accommodation for patients, with associated operating theatres, laboratories, offices and workshops	Continuous for the majority of the facility	24-hour accommodation with stringent environmental conditions, ventilation control, quarantine, and high occupant servicing needs	All services	Laboratory or operating theatre, restaurant	Furnace or forming process	Acute hospital, specialist hospital, teaching hospital and maternity hospital
21	Long term residential	Long term residential accommodation	Full accommodation, including sleeping space, day time space, all domestic facilities, some office facilities	Continuous	24-hour fully conditioned and serviced accommodation	Heating, lighting, cooling, appliances, food and hot water services, entertainment, laundry	Restaurant (dining hall)		Residential home, homeless unit, cottage hospital and long stay hospital, detention centres and prisons
22	General accommodation	General accommodation	Space for sleeping, showers, basic domestic services	Non-continuous occupancy, often only used in evenings	Slow turnover of occupants requires fewer facilities and less laundry than for example a hotel	Heating, lighting, cooling, laundry and drying rooms			Boarding houses, university and school hostels, homeless units, nursing homes
23	Emergency services	Emergency services	Offices, accommodation, food services, cells, garaging and other activities as required	Normally continuous, some stations closed in the evenings and weekends	Provision of a variety of services that would be in separate categories in other parts of the non-domestic stock (e.g. accommodation, offices and vehicle garaging)	Heating, lighting, cooling, food services, office and training equipment			Police, fire and ambulance stations
24	Laboratory or operating theatre	Laboratory or operating theatre	Special equipment and conditions in at least 30% of floor area	Either weekday or 24-hour multi-shift	Spaces requiring controlled ventilation and conditions	Heating lighting, ventilation		Furnace or forming process	Research chemical laboratory, hospital operating theatre
25	Public waiting or circulation	Bus or train station, shopping centre mall	Public circulation or waiting facilities	Variable — intermittent to continuous	Waiting and circulation areas, booking desks, boarding facilities	Heating, lighting, cooling, snack services	Retail		Bus stations, local train stations, shopping centre malls
26	Terminal	Regional transport terminal with concourse	Waiting and boarding facilities for air, ship or regional/international train travel	Daytime and evenings each day to near continuous	Concourse areas, booking areas, identification, customs, security and baggage handling	Heating, lighting, cooling, baggage handlings	Retail, restaurant, covered car park		Large train stations, airport terminals
27	Workshop	Workshop or open working area (not office)	Facilities for light mechanical work	Generally working week but can be multi-shift	Goods access, mechanical tools and facilities	Industrial heating and lighting standards		Furnace or forming process	Workshops, vehicle repair
28	Storage facility	Storage warehouse or depot	Storage and goods handling areas	Continuous storage with weekday or multi-shift goods handling	Lightly serviced long term storage areas	Low level lighting and heating in storage areas			Distribution warehouse without public areas, and local authority depot
29	Cold storage	Refrigerated warehouse	Refrigerated storage and goods handling areas	Continuous storage with weekday or multi-shift goods handling	Refrigerated long term storage areas	Refrigeration, lighting and heating of handling areas		Blast chilling or freezing plant	Refrigerated warehouse without public areas

Table 1 Benchmark categories and values; (b) benchmarks and building size metrics

[A]	[B]	[C]	[K]	[L]	[M]	[N]	[O]	[P]	[Q]	[R]
Name and description			Illustrative CO ₂ benchmarks calculated from the energy benchmarks (see Table 3)					Building size metric for use by assessors		
Category	Name	Brief description	Electricity typical benchmark (kW/h/m ²)	Fossil-thermal typical benchmark (kW/h/m ²)	Illustrative electricity typical benchmark (kgCO ₂ /m ²)	Illustrative fossil-thermal typical benchmark (kgCO ₂ /m ²)	Illustrative total typical benchmark (kgCO ₂ /m ²)	Primary metric (as in energy benchmarks)	Approved alternate metric	Default multiplier (applied to alternate metric to obtain primary metric)
1	General office	General office and commercial working areas	95	120	52.3	22.8	75.1	Gross floor area measured as RICS gross internal area (GIA)	Net lettable area (NLA) measured as RICS	1.25
2	High street agency	High street agency	140	0	77.0	0.0	77.0	Gross floor area measured as RICS gross internal area (GIA)	(none)	
3	General retail	General street retail and services	165	0	90.8	0.0	90.8	Gross floor area measured as RICS gross internal area (GIA)	Sales floor area (SFA)	1.80
4	Large non-food shop	Retail warehouse or other large non-food store	70	170	38.5	32.3	70.8	Gross floor area measured as RICS gross internal area (GIA)	Sales floor area (SFA)	1.80
5	Small food store	Small food store	310	0	170.5	0.0	170.5	Gross floor area measured as RICS gross internal area (GIA)	Sales floor area (SFA)	1.35
6	Large food store	Supermarket or other large food store	400	105	220.0	20.0	240.0	Gross floor area measured as RICS gross internal area (GIA)	Sales floor area (SFA)	2.00
7	Restaurant	Restaurant	90	370	49.5	70.3	119.8	Gross floor area measured as RICS gross internal area (GIA)	(none)	
8	Bar, pub or licensed club	Bar, pub or club	130	350	71.5	66.5	138.0	Gross floor area measured as RICS gross internal area (GIA)	(none)	
9	Hotel	Hotel or boarding house	105	330	57.8	62.7	120.5	Gross floor area measured as RICS gross internal area (GIA)	(none)	
10	Cultural activities	Museum, art gallery or other public building with normal occupancy	70	200	38.5	38.0	76.5	Gross floor area measured as RICS gross internal area (GIA)	(none)	
11	Entertainment halls	Entertainment halls	150	420	82.5	79.8	162.3	Gross floor area measured as RICS gross internal area (GIA)	(none)	
12	Swimming pool centre	Swimming pool hall, changing and ancillaries	245	1130	134.8	214.7	349.5	Gross floor area measured as RICS gross internal area (GIA)	(none)	
13	Fitness and health centre	Fitness centre	160	440	88.0	83.6	171.6	Gross floor area measured as RICS gross internal area (GIA)	(none)	
14	Dry sports and leisure facility	Dry sports and leisure facility	95	330	52.3	62.7	115.0	Gross floor area measured as RICS gross internal area (GIA)	(none)	
15	Covered car park	Car park with roof and side walls	20	0	11.0	0.0	11.0	Gross floor area measured as RICS gross internal area (GIA)	(none)	

16	Public buildings with light usage	Light use public and institutional buildings	20	105	11.0	20.0	31.0	Gross floor area measured as RICS gross internal area (GIA)	(none)
17	Schools and seasonal public buildings	Public buildings nominally used for part of the year	40	150	22.0	28.5	50.5	Gross floor area measured as RICS gross internal area (GIA)	(none)
18	University campus	University campus	80	240	44.0	45.6	89.6	Gross floor area measured as RICS gross internal area (GIA)	(none)
19	Clinic	Health centres, clinics and surgeries	70	200	38.5	38.0	76.5	Gross floor area measured as RICS gross internal area (GIA)	(none)
20	Hospital (clinical and research)	Clinical and research hospital	90	420	49.5	79.8	129.3	Gross floor area measured as RICS gross internal area (GIA)	(none)
21	Long term residential	Long term residential accommodation	65	420	35.8	79.8	115.6	Gross floor area measured as RICS gross internal area (GIA)	(none)
22	General accommodation	General accommodation	60	300	33.0	57.0	90.0	Gross floor area measured as RICS gross internal area (GIA)	(none)
23	Emergency services	Emergency services	70	390	38.5	74.1	112.6	Gross floor area measured as RICS gross internal area (GIA)	(none)
24	Laboratory or operating theatre	Laboratory or operating theatre	160	160	88.0	30.4	118.4	Gross floor area measured as RICS gross internal area (GIA)	(none)
25	Public waiting or circulation	Bus or train station, shopping centre mail	30	120	16.5	22.8	39.3	Gross floor area measured as RICS gross internal area (GIA)	(none)
26	Terminal	Regional transport terminal with concourse	75	200	41.3	38.0	79.3	Gross floor area measured as RICS gross internal area (GIA)	(none)
27	Workshop	Workshop or open working area (not office)	35	180	19.3	34.2	53.5	Gross floor area measured as RICS gross internal area (GIA)	(none)
28	Storage facility	Storage warehouse or depot	35	160	19.3	30.4	49.7	Gross floor area measured as RICS gross internal area (GIA)	(none)
29	Cold storage	Refrigerated warehouse	145	80	79.8	15.2	95.0	Gross floor area measured as RICS gross internal area (GIA)	(none)

Table 1 Benchmark categories and values; (c) weather adjustment, separable energy uses and occupancy adjustment

[A]	[B]	[C]	[S]	[T]	[U]	[V]	[W]	[X]	[Y]	[Z]
Name and description		Weather adjustment		Separable energy uses		Occupancy adjustment for days and hours of use				
Category	Name	Brief description	Percent of electricity benchmark pro-rated to degree-days	Percent of fossil-thermal benchmark pro-rated to degree-days	Separable energy uses	Definition of annual occupancy hours in this sector	Reference hours per year	Maximum allowed hours per year	Percentage increase in electricity benchmark at maximum allowed hours per year	Percentage increase in fossil-thermal benchmark at maximum allowed hours per year
1	General office	General office and commercial working areas	0%	55%	S1 — Regional server room S2 — Trading floor	Number of hours when the recorded number of occupants exceeds 25% of the nominal maximum number.	2040	8760	107%	44%
2	High street agency	High street agency	20%	0%		Number of hours when the premises are fully open to customers according to published hours.	2448	3672	22%	0%
3	General retail	General street retail and services	15%	0%		Number of hours when the premises are fully open to customers according to published hours.	2448	3672	22%	0%
4	Large non-food shop	Retail warehouse or other large non-food store	0%	55%		Number of hours when the premises are fully open to customers according to published hours.	2448	4284	32%	15%
5	Small food store	Small food store	15%	0%		Number of hours when the premises are fully open to customers according to published hours.	2448	3672	22%	0%
6	Large food store	Supermarket or other large food store	0%	55%	S3 - Bakery oven	Number of hours when the premises are fully open to customers according to published hours.	2983	4284	20%	9%
7	Restaurant	Restaurant	20%	30%		Number of hours when the premises are fully open to customers according to published hours.	3060	5712	37%	17%
8	Bar, pub or licensed club	Bar, pub or club	0%	40%		Number of hours when the premises are fully open to customers according to published hours.	3060	5712	37%	17%
9	Hotel	Hotel or boarding house	0%	45%			—	—	0%	0%
10	Cultural activities	Museum, art gallery or other public building with normal occupancy	0%	55%		Number of hours when the premises are fully open to customers according to published hours.	2040	4284	45%	20%
11	Entertainment halls	Entertainment halls	0%	55%		Number of hours when the premises are fully open to customers according to published hours.	2856	5712	41%	19%
12	Swimming pool centre	Swimming pool hall, changing and ancillaries	0%	55%		Number of hours when the premises are fully open to customers according to published hours.	2856	4641	27%	13%
13	Fitness and health centre	Fitness centre	0%	40%		Number of hours when the premises are fully open to customers according to published hours.	2754	5355	39%	18%
14	Dry sports and leisure facility	Dry sports and leisure facility	0%	55%	S4 - Sports flood lighting	Number of hours when the premises are fully open to customers according to published hours.	2754	5355	39%	18%
15	Covered car park	Car park with roof and side walls	0%	0%		Number of hours when the premises are fully open to customers according to published hours.	4284	8568	41%	0%

Public buildings with light usage	Light use public and institutional buildings	0%	55%			2,040	3,672	Eszter 3%	15%
16	Public buildings with light usage	0%	55%			2,040	3,672		
17	Schools and seasonal public buildings	0%	55%			1,400	3,672	62%	27%
18	University campus	0%	55%		S5 — Furnace, heat treatment or forming process	2,450	5,355	48%	22%
19	Clinic	0%	55%			2,040	4,284	45%	20%
20	Hospital: clinical and research	0%	55%		S5 — Furnace, heat treatment or forming process	-	-	0%	0%
21	Long term residential	0%	55%			-	-	0%	0%
22	General accommodation	0%	55%			2,940	4,284	21%	10%
23	Emergency services	0%	55%			-	-	0%	0%
24	Laboratory or operating theatre	0%	55%		S5.Furnace, heat treatment or forming process	2,040	8,568	105%	43%
25	Public waiting or circulation	0%	55%			-	-	0%	0%
26	Terminal	0%	55%			-	-	0%	0%
27	Workshop	0%	55%		S5.Furnace, heat treatment or forming process	2,040	3,672	34%	16%
28	Storage facility or depot	0%	70%			2,040	4,284	45%	20%
29	Cold storage	0%	55%		S6.Blast chilling or freezing	-	-	0%	0%

Table 2 Allocation of building types to benchmark categories

No.	Building type	Benchmark category	Category name	No.	Building type	Benchmark category	Category name
1	Adult education centre	1	General office	64	Warehouse shop	4	Large non-food shop
2	Air traffic control	1	General office	65	Warehouse showroom	4	Large non-food shop
3	Bank office	1	General office	66	Corner food shops, butchers	5	Small food store
4	Building society office	1	General office	67	Corner food shops, greengrocers and delicatessens	5	Small food store
5	Business units	1	General office				
6	Call centre	1	General office				
7	Central government office	1	General office	68	Supermarket	6	Large food store
8	Commercial office	1	General office				
9	Conference centre	1	General office	69	Cafe	7	Restaurant
10	Courts	1	General office	70	Canteen	7	Restaurant
11	Crown and county courts	1	General office	71	Eating place	7	Restaurant
12	Crown court	1	General office	72	Food courts	7	Restaurant
13	Financial service office	1	General office	73	Mess, junior ranks (accommodation only)	7	Restaurant
14	Flight crew facility	1	General office				
15	Guardroom	1	General office	74	Mess, junior ranks (catering only)	7	Restaurant
16	Law facilities	1	General office	75	Mess, officers (catering only)	7	Restaurant
17	Legal/financial services	1	General office	76	Mess, warrant officers and sergeants (catering only)	7	Restaurant
18	Local government office	1	General office				
19	Office showroom	1	General office	77	Motorway service areas	7	Restaurant
20	Office with industry	1	General office	78	NAAFI	7	Restaurant
21	Offices	1	General office	79	Restaurant	7	Restaurant
22	Offices, cellular, naturally ventilated	1	General office	80	Takeaway restaurant	7	Restaurant
23	Offices, mechanically ventilated and/or air conditioned	1	General office	81	Discotheque	8	Bar, pub or licensed club
24	Offices, open plan, naturally ventilated	1	General office	82	Night club	8	Bar, pub or licensed club
25	Professional/design	1	General office				
26	Professional services, off-street	1	General office	83	Public house	8	Bar, pub or licensed club
27	Public sector offices	1	General office				
28	Simulator	1	General office	84	Wine bar	8	Bar, pub or licensed club
29	Studio office	1	General office				
30	Town hall	1	General office	85	Hotel	9	Hotel
31	Warehouse office	1	General office	86	Art gallery	10	Cultural activities
32	Bank or building society	2	High street agency	87	Arts centre	10	Cultural activities
33	Betting shop	2	High street agency	88	Library	10	Cultural activities
34	Estate agents	2	High street agency	89	Museum	10	Cultural activities
35	Insurance brokers	2	High street agency	90	Auditorium	11	Entertainment halls
36	Legal/insurance/accountants high street premises	2	High street agency	91	Bingo hall	11	Entertainment halls
37	Post Office	2	High street agency	92	Casino	11	Entertainment halls
38	Public services	2	High street agency	93	Cinema	11	Entertainment halls
39	Travel agent	2	High street agency	94	Concert hall	11	Entertainment halls
40	Undertakers	2	High street agency	95	Dancing school	11	Entertainment halls
41	Amusement arcade	3	General retail	96	Entertainment hall	11	Entertainment halls
42	Beauty salon	3	General retail	97	Theatre	11	Entertainment halls
43	Confectioners, tobacconists, newsagents, off licences	3	General retail	98	Swimming pool	12	Swimming pool centre
44	Dry cleaner	3	General retail	99	Fitness centre	13	Fitness and health centre
45	Garden centres	3	General retail	100	Gymnasium	13	Fitness and health centre
46	Hairdressing salon	3	General retail	101	Health club	13	Fitness and health centre
47	Indoor markets	3	General retail				
48	Laundrette	3	General retail	102	Ice skating rinks	14	Dry sports and leisure facility
49	Personal services	3	General retail	103	Indoor bowling	14	Dry sports and leisure facility
50	Pet shops	3	General retail				
51	Petrol filling stations	3	General retail	104	Leisure centre	14	Dry sports and leisure facility
52	Department store	4	Large non-food shop	105	Pavilion/sports clubhouse	14	Dry sports and leisure facility
53	Departmental and general stores	4	Large non-food shop	106	Racecourse	14	Dry sports and leisure facility
54	Factory shop	4	Large non-food shop	107	Roller skating rinks	14	Dry sports and leisure facility
55	Factory showroom	4	Large non-food shop				
56	Hypermarket	4	Large non-food shop	108	Snooker club	14	Dry sports and leisure facility
57	Large shop	4	Large non-food shop	109	Sports centre with pool	14	Dry sports and leisure facility
58	Retail showroom	4	Large non-food shop				
59	Retail warehouse	4	Large non-food shop				
60	Shop with industry	4	Large non-food shop				
61	Showroom	4	Large non-food shop				
62	Superstore	4	Large non-food shop				
63	Vehicle showroom	4	Large non-food shop				

Table continues

Table 2 Allocation of building types to benchmark categories — *continued*

No.	Building type	Benchmark category	Category name	No.	Building type	Benchmark category	Category name
110	Sports ground	14	Dry sports and leisure facility	138	Pre-school facility	17	Schools and seasonal public buildings
111	Sports ground buildings	14	Dry sports and leisure facility	139	Primary and secondary teaching establishments	17	Schools and seasonal public buildings
112	Sports hall	14	Dry sports and leisure facility	140	Primary school	17	Schools and seasonal public buildings
113	Squash club	14	Dry sports and leisure facility	141	Private school	17	Schools and seasonal public buildings
114	Tennis courts etc	14	Dry sports and leisure facility	142	Reserves centre	17	Schools and seasonal public buildings
115	Covered parking	15	Covered car park	143	School	17	Schools and seasonal public buildings
116	Beach huts	16	Public buildings with light usage	144	Secondary school	17	Schools and seasonal public buildings
117	Bus depot	16	Public buildings with light usage	145	Social clubs	17	Schools and seasonal public buildings
118	Cemetery	16	Public buildings with light usage	146	Special school	17	Schools and seasonal public buildings
119	Church	16	Public buildings with light usage	147	Speedway	17	Schools and seasonal public buildings
120	Church with cemetery	16	Public buildings with light usage	148	State primary school	17	Schools and seasonal public buildings
121	Parking building	16	Public buildings with light usage	149	State school	17	Schools and seasonal public buildings
122	Place of worship	16	Public buildings with light usage	150	State secondary school	17	Schools and seasonal public buildings
123	Places of religious worship	16	Public buildings with light usage	151	Unlicensed club	17	Schools and seasonal public buildings
124	Public lavatory	16	Public buildings with light usage	152	Village hall	17	Schools and seasonal public buildings
125	Sacred place	16	Public buildings with light usage	153	Classroom	18	University campus
126	Scout or Guide hut	16	Public buildings with light usage	154	Lecture hall	18	University campus
127	Clubhouse	17	Schools and seasonal public buildings	155	Sixth form college	18	University campus
128	Community centre	17	Schools and seasonal public buildings	156	University	18	University campus
129	Community facilities	17	Schools and seasonal public buildings	157	Clinic or health centre	19	Clinic
130	Community meeting place	17	Schools and seasonal public buildings	158	Dentist's surgery	19	Clinic
131	Creche	17	Schools and seasonal public buildings	159	Doctor's surgery	19	Clinic
132	Creche/childcare facility	17	Schools and seasonal public buildings	160	Health Centres and Clinics	19	Clinic
133	Day centre	17	Schools and seasonal public buildings	161	Medical and dental centre (combined)	19	Clinic
134	Dogs racecourse	17	Schools and seasonal public buildings	162	Medical centre	19	Clinic
135	Hunting and fishing	17	Schools and seasonal public buildings	163	Mortuary	19	Clinic
136	Marina or sailing club	17	Schools and seasonal public buildings	164	Occupational health centre	19	Clinic
137	Nursery or kindergarten	17	Schools and seasonal public buildings	165	Out patient treatment area	19	Clinic
				166	Primary health care buildings	19	Clinic
				167	Surgery or clinic	19	Clinic
				168	Veterinary surgery	19	Clinic
				169	General acute hospital	20	Hospital (clinical and research)
				170	Teaching/Specialist Hospital	20	Hospital (clinical and research)
				171	Community and mental health hospitals	21	Long term residential

Table continues

Table 2 Allocation of building types to benchmark categories — *continued*

No.	Building type	Benchmark category	Category name	No.	Building type	Benchmark category	Category name
172	Detention	21	Long term residential	197	Ambulance station	23	Emergency services
173	Detention centre	21	Long term residential	198	Emergency services	23	Emergency services
174	Home	21	Long term residential	199	Fire station	23	Emergency services
175	Hospital	21	Long term residential	200	Lifeboat station	23	Emergency services
176	Hostel	21	Long term residential	201	Police station	23	Emergency services
177	Nursing home	21	Long term residential	202	Police station (MoD police)	23	Emergency services
178	Nursing residential homes and hostels	21	Long term residential	203	Laboratory	24	Laboratory or operating theatre
179	Prison	21	Long term residential	204	Shopping centre mall	25	Public waiting or circulation
180	Remand centre	21	Long term residential	205	Bus station/train station/seaport terminal	25	Public waiting or circulation
181	Young offenders insti't'n	21	Long term residential	206	Dock, wharf	25	Public waiting or circulation
182	Boarding/guesthouse	22	General accommodation	207	Railway premise	25	Public waiting or circulation
183	Cadet hut	22	General accommodation	208	Railway station	25	Public waiting or circulation
184	Holiday accommodation	22	General accommodation	209	Airport terminals	26	Terminal
185	Holiday centre	22	General accommodation	210	Armoury	26	Terminal
186	Holiday let	22	General accommodation	211	Railway mixed use	26	Terminal
187	Junior ranks accommodation	22	General accommodation	212	Comms facility	27	Workshop
188	Mess, officers (accommodation only)	22	General accommodation	213	Contractors sheds etc.	27	Workshop
189	Mess, officers (catering and accommodation)	22	General accommodation	214	Crematorium	27	Workshop
190	Mess, warrant officers and sergeants (accommodation only)	22	General accommodation	215	Fixed wing aircraft, repair	27	Workshop
191	Mess, warrant officers and sergeants (catering and accommodation)	22	General accommodation	216	Garage	27	Workshop
192	MoD civilian accommodation	22	General accommodation	217	Gas/decontamination chamber	27	Workshop
193	Official service residence	22	General accommodation	218	Helicopters, repair	27	Workshop
194	School boarding house	22	General accommodation	219	Manufacturing premises (excluding process energy use)	27	Workshop
195	Service families accommodation (officers, type 1)	22	General accommodation	220	Observatories	27	Workshop
196	Transient accommodation (other ranks)	22	General accommodation	221	Petrol filling station	27	Workshop
				222	Railway engine shed	27	Workshop
				223	Recording studios	27	Workshop
				224	Ship/submarine repair/refit	27	Workshop
				225	Sorting office	27	Workshop
				226	Telephone exchange	27	Workshop
				227	Vehicle repair workshop	27	Workshop
				228	Vehicle services	27	Workshop
				229	Workshop	27	Workshop
				230	Workshops/maintenance depot	27	Workshop
				231	Fixed wing aircraft, storage	28	Storage facility
				232	Garages	28	Storage facility
				233	Helicopters, storage	28	Storage facility
				234	Road haulage depot	28	Storage facility
				235	Storage depot	28	Storage facility
				236	Vehicle storage	28	Storage facility
				237	Cold store	29	Cold storage

Table 3 Data common to all benchmark categories

Item	Notes
CO ₂ emission factors used to calculate CO ₂ benchmarks*:	
— electricity	0.550 kgCO ₂ /kW·h
— fossil-thermal	0.190 kgCO ₂ /kW·h
Degree-days:	
— type:	Heating degree-days with 15.5 °C base and threshold temperature
— reference value	2021 degree-days

* Factors used to derive the illustrative benchmark CO₂ emissions from the energy benchmarks; the Operation Rating procedure will use agreed CO₂ factors (which may differ from those in this table) to calculate CO₂ benchmarks

Appendix A1: Weather adjustment

Weather adjustment is a standard part of the operational rating procedure which is automatically implemented in the approved software with no requirement for assessor input. It increases the relevance of an operational rating by adjusting the benchmark consumption according to the weather for the region and year of the assessment.

For this weather adjustment, twelve month heating degree-days with a base temperature of 15.5 °C are used due to their relevance, availability and body of experience. These degree-days have been used successfully over decades in a wide range of sectors and are currently used by the Carbon Trust.

As agreed by the CLG benchmark project steering committee, cooling degree-days are not included in the calculation procedure. Their applicability to different buildings is highly variable and their sectoral use is not considered to be well established.

Benchmark energy consumption values in the main tables are associated with a reference national annual 15.5 °C degree-day value against which the actual degree-day value (for the region and year of the operational rating) is compared, to provide a ratio which scales the weather-dependent part of the benchmark energy.

The 15.5 °C degree-days are used in all sectors. This includes office buildings, where a lower base temperature might have been considered as many buildings have low balance-point temperatures. Hospitals have traditionally have used a base temperature of 18.5 °C.

However, the 15.5 °C degree-days produce an appropriate adjustment, especially for the annual calculations required for the Operational Rating, because the ratio of the actual annual degree-days to the reference value does not change greatly if the degree-day base is changed.

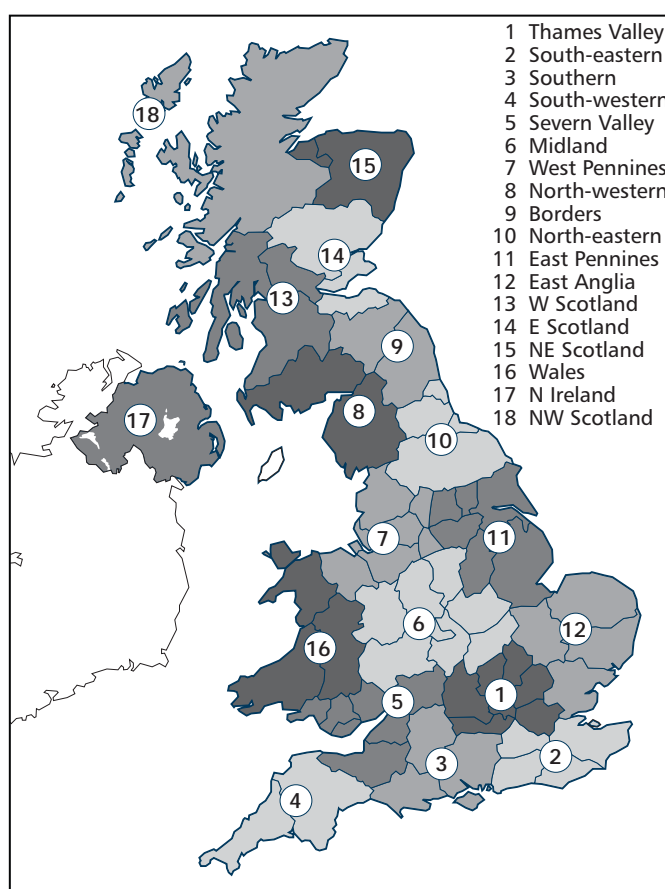


Figure A1.1 Degree-day regions

If monthly calculations including summer months were required it would be helpful to optimise the degree-day base temperature to a value such as the balance temperature of the building, but for annual Operational Ratings calculations sensitivity analysis confirms that this is a second-order effect.

Table A1.1 12-month 15.5 °C degree-day data over 14 regions for calendar years 1998–2007 (source: The Carbon Trust/Vilnis Vesma)

Year	Degree-day region														Ave.	Diff.
	1	2	3	4	5	6	7	8	9	10	11	12	16	17		
1998	1747	2007	1924	1729	1627	2148	2032	2236	2293	2269	2142	2129	1975	2145	2029	0%
1999	1681	1976	1901	1651	1597	2030	1939	2218	2265	2180	2031	2070	1912	2144	1971	-2%
2000	1732	2042	1988	1720	1675	2154	2048	2394	2339	2292	2125	2101	2082	2268	2968	2%
2001	1880	2201	2165	1753	1844	2234	2220	2620	2416	2457	2281	2260	2100	2308	2196	9%
2002	157	1876	1745	1569	1780	2001	1914	2374	2234	2229	1995	1974	1917	2077	1947	-4%
2003	1733	2111	1820	1671	1920	2086	2034	2297	2198	2298	2076	2121	1987	2186	2038	1%
2004	1719	2054	1796	1669	1853	2028	2002	2191	2178	2185	2009	2100	1984	2197	1998	-1%
2005	1759	2075	2004	1713	1889	2047	2205	2211	2212	2189	2081	2148	1928	2160	2044	1%
2006	1679	1929	1977	1691	1839	2044	1940	2188	2249	2173	2023	2046	1966	2179	1995	-1%
2007	1591	1940	1893	1496	1774	2026	2033	2156	2185	2098	1925	1987	1844	2019	1926	-5%
Ave:	1709	2021	1921	1666	1780	2080	2037	2289	2257	2237	2069	2094	1970	2168	2021	0%
Diff:	-15%	0%	-5%	-18%	-12%	3%	1%	13%	12%	11%	2%	4%	-3%	7%	0%	—
Diff:																
2001	-7%	9%	7%	-13%	-9%	11%	10%	30%	20%	22%	13%	12%	4%	14%	2196	9%
2003	-14%	4%	-10%	-17%	-5%	3%	1%	14%	9%	14%	3%	5%	-2%	8%	2038	1%
2007	-21	-4%	-6%	-26%	-12%	0%	1%	7%	8%	4%	-5%	-2%	-9%	0%	1926	-5%

Key to degree-day regions: (1) Thames Valley, (2) South Eastern, (3) Southern, (4) South Western, (5) Severn Valley, (6) Midland, (7) West Pennines, (8) North Western, (9) Borders, (10) North Eastern, (11) East Pennines, (12) East Anglia, (16) Wales, (17) Northern Ireland.

Buildings with high balance temperatures are now less common because elevated internal temperatures are increasingly offset by higher internal gains, better standards of insulation, building air leakage prevention and heat recovery.

Degree-days for the entire 12-month year are used because selecting a certain months as a 'heating season' may not be appropriate for all regions, and varying the heating season by region is complex and to some extent arbitrary. Summer degree-days are relatively low and so have little effect on the ratio of actual annual degree-days to the reference value.

The reference degree-day value given in this benchmark set is 2021 degree-days and is common to all sectors because the degree-day base temperature (15.5 °C) is common to all sectors. The reference value is a ten-year simple average to December 2007 across all regions of England, Wales and Northern Ireland, see Table A1.1. The reference value is 18% lower than a previous reference value (2462), but it is closer to likely current values and produces smaller adjustments.

The difference ('Diff.') values are calculated with respect to the reference value (2021) and illustrate the likely variation between different regions and years.

Appendix A2: Separable energy uses

Some activities within buildings use significant amounts of energy, including catering facilities and server rooms. These high usage areas may only occupy a small percentage of the useful floor area, and their use may be highly variable, and so they can have a significant effect on the overall Operational Rating of the building. The relevance, accuracy and value of the Operational Rating may be improved by separating out such energy use.

Separating out particular energy uses is an optional part of the Operational Rating procedure. It increases the relevance of an Operational Rating where a building has specific 'process' energy uses which cannot meaningfully be included in the benchmark comparison exercise.

Separable energy uses are those energy uses within a building's overall metered energy consumption which the Operational Rating procedure allows to be reported separately from the main energy rating of the building. Where the separable energy use is deducted from the total metered consumption, the floor area associated with the separable use is also deducted.

This part of the procedure is simply omitted if the building has no metered separable energy use, in which case all the building's energy is counted in the main assessment. If there are un-metered separable energy uses, this provides an incentive to meter them for future assessments.

Table A2.1 sets down the complete list of separable energy uses which can, if all the relevant criteria are satisfied, be subtracted from the metered energy use of building in the specified categories. The table provides information on the separable energy uses as follows:

- Columns A–C: name and description of the separable energy use
- Column D: benchmark categories within which the separable energy uses can be used
- Column H: measurement procedures (area) — the floor area associated with a separable energy use must be measured as it is subtracted from the building total floor area
- Column I: measurement procedures (energy) — the metering requirement is described which must

be carried out before the energy used can be claimed as separable.

- Column J: quantitative evidence — description of the quantitative evidence required to support entry of a separable energy use
- Column L: validation — there must be confirmation from the building manager or assessor that the energy is indeed used for the purpose which justifies its subtraction from the building energy use
- Column M: validation 2 — evidence must be presented that the excluded energy use has been assessed in the last two years - this is to reduce the possibility that a high energy using application is kept going indefinitely even if highly inefficient.
- Column N: sign off — evidence to be collated into a report and signed off by the occupant's property manager.

In order to be separated, the energy use must:

- be one of the listed separable energy uses in Table 2
- be for one of the benchmarks for which this separable energy applies (Table 2)
- comply with the criteria defining the separable energy use
- have permanently metered energy use
- have meter readings and analysis for the rating period
- have associated floor area measured and recorded
- have a documented review of energy use and efficiency with improvement proposals
- have a collated Separable Energy Record summarising all the above and signed off by the occupant's property manager.

No other energy uses may be separated from a building's assessment.

The Operational Rating procedure requires the energy consumption (by supply type) and floor area of any separable energy use. Assessors have the option to enter this information only if they have completed a Separable Energy Record.

Table A2.1 Separable energy uses; (a) measurement procedures

[A]		[B]		[C]		[D]		[E]		[F]		[G]	
		Separable energy use description		Benchmark categories		Associated floor area to be measured for subtraction from GIA		Measurement procedures		Quantification of energy use		Quantitative evidence	
Number	Name	Description	Benchmark categories	Associated floor area to be measured for subtraction from GIA	Measurement procedures	Quantification of energy use	Quantitative evidence						
S1	Regional server room	Data processing facilities on a regional or national basis. Excludes facilities serving only local or in-building networks.	1. General office	Server room floor area	Metered energy use using permanent meters for server room and dedicated air conditioning, or metered energy use of electronic data processing equipment excluding air conditioning plus allowance of 40% for air conditioning.	Record of meter readings, energy consumption calculation and location of permanent meters. Floorplan indicating associated floor area.							
S2	Trading floor	Trading or dealing floor area with typically 3 screens per station	1. General office	Trading floor net area	Metered energy use using permanent meters of trading stations and dedicated processing and servicing such as lighting and air conditioning.	Record of meter readings, energy consumption calculation and location of permanent meters. Floorplan indicating associated floor area.							
S3	Bakery oven	In-store bakery oven	6. Large food store	Floor area of room dedicated to the process - may be zero if free-standing.	Metered consumption using permanent meter(s) of the oven	Record of meter readings, energy consumption calculation and location of permanent meters. Floorplan indicating associated floor area.							
S4	Sports flood lighting	Flood lighting of external sports facilities	14. Dry sports and leisure facility	None - external areas are not included in the GIA	Metered consumption using permanent meter(s) of the lighting.	Record of meter readings, energy consumption calculation and location of permanent meters. Floorplan indicating associated floor area.							
S5	Furnace, heat treatment or forming process	High intensity furnace, heat treatment or forming process within a workshop or laboratory	18. University campus, 20. Hospital clinical and research, 24. Laboratory or operating theatre, 27. Workshop	Floor area of room dedicated to the process - may be zero if free-standing.	Metered consumption using permanent meter(s) of the process.	Record of meter readings, energy consumption calculation and location of permanent meters. Floorplan indicating associated floor area.							
S6	Blast chilling or freezing	One-off processing of incoming goods to change their status	29. Cold storage	Floor area of room dedicated to the process - may be zero if free-standing.	Metered consumption using permanent meter(s) of the plant.	Record of meter readings, energy consumption calculation and location of permanent meters. Floorplan indicating associated floor area.							

Table continues

Table A2.1 Separable energy uses; (b) validation requirements

[A]	[B]	[C]	[L]	[M]	[F]
Separable energy use description			Validation required		
Number	Name	Description	Validation evidence 1	Validation evidence 2	Sign off
S1	Regional server room	Data processing facilities on a regional or national basis. Excludes facilities serving only local or in-building networks.	Confirmation that more than 75% of the server room function is for regional or national operations and location of meters.	Evidence (e.g. report title and date) that the server room has been assessed for efficiency in the last two years	Evidence to be collated into a report and signed off by the occupant's property manager.
S2	Trading floor	Trading or dealing floor area with typically 3 screens per station	Confirmation by the building manager that the floor area is used for dealing or trading and that energy use has been metered.	Evidence (e.g. report title and date) that the area has been assessed for efficiency in the last two years	Evidence to be collated into a report and signed off by the occupant's property manager.
S3	Bakery oven	In-store bakery oven	Confirmation by the assessor that the oven is for baking	Evidence (e.g. report title and date) that the process has been assessed for efficiency in the last two years	Evidence to be collated into a report and signed off by the occupant's property manager.
S4	Sports flood lighting	Flood lighting of external sports facilities	Confirmation by the assessor that the metered energy is for external sports lighting	Evidence (e.g. report title and date) that the lighting and its control has been assessed for efficiency in the last two years	Evidence to be collated into a report and signed off by the occupant's property manager.
S5	Furnace, heat treatment or forming process	High intensity furnace, heat treatment or forming process within a workshop or laboratory	Confirmation by the assessor that the metered energy is for the blast chilling or freezing	Evidence (e.g. report title and date) that the process has been assessed for efficiency in the last two years	Evidence to be collated into a report and signed off by the occupant's property manager.
S6	Blast chilling or freezing	One-off processing of incoming goods to change their status	Confirmation by the assessor that the metered energy is for the special energy process	Evidence (e.g. report title and date) that the process has been assessed for efficiency in the last two years	Evidence to be collated into a report and signed off by the occupant's property manager.

Appendix A3: Occupancy adjustment

Occupancy adjustment is an optional part of the Operational Rating procedure. It increases the relevance of an Operational Rating in buildings whose occupancy is different to the benchmark occupancy value, by adjusting the listed energy consumption benchmarks according to the actual occupancy of a building.

If suitably documented occupancy of the building is not available or is the same as the benchmark occupancy, the occupancy adjustment is simply omitted and the listed (unadjusted) energy benchmarks are then used. If actual occupancy is higher this approach provides an incentive to obtain the required occupancy data for future assessments.

The information required from the assessor for occupancy adjustment is a valid assessment and record of the occupancy of the building. The annual occupancy hours must be assessed according to the approved procedure and measurements described below.

The Operational Rating procedure has the following benchmark data available from Table 1 for each benchmark category:

- listed energy consumption benchmarks
- reference occupancy hours for the listed benchmarks
- maximum (limiting) occupancy hours
- maximum percentage increase in energy consumption at the limiting occupancy hours for both electricity and fossil thermal fuel use.

The Operational Rating procedure then adjusts the benchmark as follows:

- If the building occupancy is less than or equal to the reference occupancy in Table 1, the benchmark listed in the table is used with no adjustment.
- If the building occupancy is equal to or higher than the limiting occupancy in Table 1 the

benchmark is adjusted by applying the limiting percentage increase in the Table.

- For occupancy values in between these two extremes the percentage increase is interpolated on a pro-rata basis to obtain the adjusted benchmark: there is a linear dependence of the adjusted benchmark on the occupancy.

To obtain the annual occupancy hours the assessor must use the appropriate occupancy measurement systems as allocated for each benchmark category in Table 1. The two definitions of annual occupancy hours are:

- (a) the number of hours per year that the number of recorded occupants exceeds 25% of the nominal maximum occupancy
- (b) the number of hours per year that the premises are fully open to the public according to published opening hours.

The assessor must obtain attendance records, survey results or published opening hours and calculate the annual occupancy hours. This information is to be collated into an annual occupancy hours record and signed off by the building or premises manager before the assessor uses the occupancy data in the Operational Rating procedure.

Where different parts of the building (falling within the same benchmark category) have different occupancies the lowest occupancy must be used, unless an assessment of occupancy in each part is made and the occupancies combined using the percentages of overall floor areas, i.e. using an area-weighted average.

For occupancy adjustment of a multi-use building assessment (employing more than one benchmark category), the annual occupancy hours must be calculated as above for each category for which an occupancy adjustment is relevant.

Appendix A4: Notes on specific building types

A4.1 Data centres

Data centres have substantial unoccupied process areas and their energy consumption is dominated by process equipment. They are therefore classified as industrial buildings for which an Operational Rating is not required and so benchmark data are not provided.

A building is classified as a data centre for Operational Rating benchmark purposes if it has been designed or altered primarily to provide data processing services and if less than a total of 10% of its gross internal floor area consists of activities covered by one or more of the benchmark categories in Table 1.

For office buildings with substantial data centre/server provision, the data centre energy can be measured and treated as a separable energy use.

A4.2 Retail premises and malls

Individual retail premises, including outward-facing units associated with retail centres, are to be assessed individually using the appropriate retail benchmark from Table 1. If they have any services energy such as heating or cooling from shopping centre services, their energy allocation for these services should be included.

Shopping centre malls, if required to be assessed separately, should use the public circulation benchmark category 25.

Inward-facing units in a shopping centre can be assessed exactly as the individual units described above. In some circumstances it may also be appropriate to assess a whole centre, or part of the centre comprising the malls and inward facing units, in which case the total energy including tenants' supplies and the appropriate allocation of landlords energy for the tenants and malls should be compared with a composite, multi-use benchmark derived from the total area of each category of retail included and the malls.