TECHNICAL STATEMENT

FOR LIA MEMBER USE ONLY

United Kingdom Building Regulations - Energy Efficiency

This LIA Technical Statement details the building regulation guidance for energy efficiency applicable to lighting in the devolved legislatures of the UK.

England = building regulations Approved Document L, Volume 1 and Volume 2
Latest version = 2021 Edition + 2023 Amendments
Came into force on 15 June 2022
https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l

Wales = building regulations Approved Document L, Volume 1 and Volume 2
Latest version = 2022 Edition
Came into force on 23 November 2022 (Volume 1) or 29 March 2023 (Volume 2)
https://www.gov.wales/building-regulations-guidance-part-l-conservation-fuel-and-power

Scotland = Technical Handbooks, Section 6 and Building Services Compliance Guides
Latest version = June 2023
Came into force on 5 June 2023
https://www.gov.scot/policies/building-standards/monitoring-improving-building-regulations/

Northern Ireland = Technical Booklets F1 and F2
Latest version = June 2022
Came into force on 30 June 2022
https://www.finance-ni.gov.uk/articles/building-regulations-technical-booklets
References Domestic Building Services Compliance Guide, 2010 edition and Non-domestic Building Services Compliance Guide, 2013 edition

Requirements are split depending upon the building type, either dwellings/domestic or buildings other than dwellings/non-domestic. They also consider whether the development is a new building or a refurbishment of an existing building.

For a new building or a major refurbishment (where the building fabric is affected), the lighting requirements cannot be considered in isolation but as part of the whole building fabric and building services. Compliance is demonstrated via an approved calculation methodology such as the SAP software for domestic buildings and the SBEM software for non-domestic buildings. Therefore, to demonstrate compliance, data for all of the building parameters must be available.

LIA members should also see LIA IS28 concerning guidance on SBEM.

For minor refurbishments, lighting may be considered in isolation without consideration of other building criteria through the elemental approach.

NOTE: words highlighted in colour in the requirements (e.g. 65 **light source lumens** per **circuit-watt***) generally link to definitions in the published documents.*

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Overview of main requirements:

Dwellings / Domestic	
England, Wales & Scotland	**NI**
Internal: lamps > 75 light source lumens per circuit-watt	**Internal:** 3 out of 4 low energy light fittings (>45 lamp lumens per circuit-watt & >400 lamp lumens) *Fittings <5W are excluded*
External: controls to switch off if daylight + auto-occupancy control if <75 light source lumens per circuit-watt ***or*** + manual control if >75 light source lumens per circuit-watt	**External:** fittings <100W + auto-occupancy control + auto-daylight control ***or*** lamps >45 lumens per circuit-watt + auto-daylight + manual control
Buildings other than dwellings / Non-Domestic	
England, Wales & Scotland	**NI**
General lighting: average 95 luminaire lumens per circuit-watt ***or*** LENI	**General lighting:** average 60 luminaire lumens per circuit-watt, reduced by control factors according to Table 42 ***or*** LENI (Table 44/Section 12.5)
Display lighting: average 80 light source lumens per circuit-watt ***or*** rated power usage no greater than 0.3W/m^2 in each space ***or*** LENI	**Display lighting:** average 22 lamp lumens per circuit-watt ***or*** LENI (Table 44/Section 12.5)
High excitation purity light sources: average 65 light source lumens per circuit-watt	**High excitation purity light sources:** *Not included*

TECHNICAL STATEMENT

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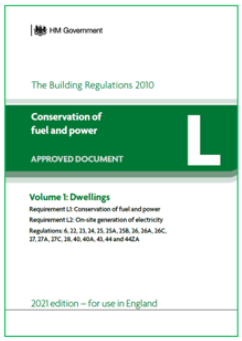
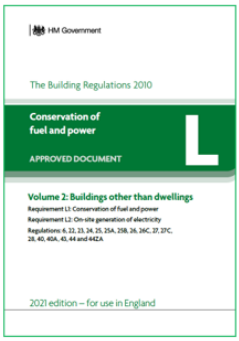
ENGLAND

The Government of England has published the latest version of the Building Regulations 2010 for England – Approved Document L, on the Conservation of Fuel and Power – Volume 1: Dwellings and Volume 2: Buildings other than dwellings. These were published on the 15th of December 2021 in two separate documents.
NOTE: Volume 2 was revised by the Department for Levelling Up Housing & Communities on 24th February 2022 and amended 2nd February 2023.

The Building Regulations 2010
Approved Document L
Conservation of Fuel and Power
Volume 1:
Dwellings
(2021 edition – incorporating 2023 amendments - for use in England)





The Building Regulations 2010
Approved Document L
Conservation of Fuel and Power
Volume 2:
Buildings other than dwellings
2021 edition – incorporating 2023 amendments - for use in England)

These approved documents support Part L of Schedule 1 to the Building Regulations 2010.
These approved documents take effect on **15th June 2022** for use in **England**.
It does not apply to work subject to a building notice, full plans application or initial notice submitted before that date, provided the work is started on site before **15th June 2023**.

The Building Regulations 2010 – Approved Document L – Conservation of Fuel and Power Volume 1: Dwellings

The Building Regulations 2010 – Approved Document L – Conservation of Fuel and Power Volume 2: Buildings other than dwellings

Schedule 1 – Part L Conservation of fuel and power
L1. Reasonable provision shall be made for the conservation of fuel and power in buildings by:
(a)
(b) providing fixed building services which:
(i) are energy efficient to a reasonable standard
(ii) have effective controls; and
(iii) are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances.

The Building Regulations 2010 – Approved Document L – Conservation of Fuel and Power Volume 1: Dwellings

Lighting

6.57 Any fixed lighting should achieve lighting levels appropriate to the activity in the space and spaces should not be over-illuminated. In many cases, it is likely that householders will be able to choose the lamp installed in the individual space.

6.58 Where installed in a new or existing dwelling, each internal light fitting should have lamps with a minimum luminous efficacy of 75 **light source lumens** per **circuit-watt**.

6.59 Where installed in a new or existing dwelling, internal light fittings should have local controls to allow for the separate control of lighting in each space or zone. Controls may be manual, automatic or a combination of both.

6.60 Where installed in a new or existing dwelling, fixed external lighting should have both of the following controls.
a. Automatic controls which switch luminaires off in response to daylight.
b. If luminous efficacy is 75 **light source lumens** per **circuit-watt** or less, automatic controls which switch luminaires off after the area lit becomes unoccupied. If luminous efficacy is greater than 75 **light source lumens** per **circuit-watt**, manual control is acceptable.

Building automation and control systems

6.61 Where a building automation and control system is installed, it should have appropriate control capabilities for the dwelling, based on the type of building, its expected use and potential energy savings.

6.62 The system should be specified and installed according to the manufacturer's instructions to ensure that its overall performance meets a reasonable standard.

6.63 For large or complex buildings, the guidance in Approved Document L, Volume 2: Buildings other than dwellings should be followed.

The Building Regulations 2010 – Approved Document L – Conservation of Fuel and Power Volume 2: Buildings other than dwellings

System specific guidance – Lighting

6.59 Any fixed lighting should achieve levels of illumination appropriate to the activity in the space. Spaces should not be over-illuminated. Lighting should be designed based on CIBSE's *SLL Lighting Handbook* or an equivalent design guide.

NOTE: *For smaller spaces where total lighting power is likely to be low (toilets, storerooms etc.) there is no expectation that lighting calculations should be produced.*

6.60 Lighting should observe the following.

(a) If it is general lighting, either:

(i) have an average luminaire efficacy of 95 **luminaire lumens** per **circuit-watt**
(ii) the **Lighting Energy Numeric Indicator** (**LENI**) method, following Appendix B.

(b) If it is display lighting, any of the following:

(i) have an average light source efficacy of 80 **light source lumens** per **circuit-watt**
(ii) have a rated power usage no greater than 0.3W/m^2 in each space
(iii) the **LENI** method, following Appendix B.

For **high excitation purity light sources**, an average light source efficacy of 65 **light source lumens** per **circuit-watt**.
This approved document does not include minimum standards for specialist lighting, such as theatrical spotlights, stage lighting, gobo projectors or wall-washers.

6.61 General lighting and **display lighting** should be metered by one of the following methods.

(a) Dedicated lighting circuits with a kWh meter for each circuit.

(b) Local power meter coupled to or integrated in the lighting controllers of a lighting management system.

(c) A lighting management system that can both:
i. calculate the consumed energy
ii. make this information available to a building management system

Lighting controls

6.62 Lighting controls in new and existing buildings should follow the guidance in the Building Research Establishment's Digest 498.

6.63 Unoccupied spaces should have automatic controls to turn the general lighting off when the space is not in use (e.g., through presence detection). Occupied spaces should have automatic controls where suitable for the use of the space.

6.64 General lighting in occupied spaces should have daylight controls (e.g., photo-switching and dimming) for parts of the space which are likely to receive high levels of natural light.

6.65 Display lighting should be controlled on dedicated circuits that can be switched separately from those for lighting provided for general illuminance.

Appendix B: Lighting Energy Numeric Indicator (LENI)

B1 The Lighting Energy Numeric Indicator (LENI) method is an alternative approach for complying with the standards for lighting given in Section 6 of this approved document.

B2 The LENI should not exceed the lighting energy limit specified in Table B1 for a given illuminance and number of hours run.

Step 1: Determine the lighting energy limit from Table B1. If display lighting is used, the lighting energy limit may be increased by the value given for normal display lighting for the area of the room where display lighting is used.

Step 2: Calculate the parasitic energy use (E_p) – If the parasitic energy use is unknown, an allowance of 0.3W/m^2 should be made for any control system. If no lighting control system is used, then $E_p = 0$.

Step 3: Determine the total power of lighting (P_l).

Step 4: Determine the occupancy factor (F_o) – If no automatic control is used, then $F_o = 1$. If controls turn off the lights within 20 minutes of the room being empty, then $F_o = 0.8$.

Step 5: Determine the factor for daylight (F_d) – If no daylight-linked dimming system is used, then Fd = 1. If the electric lighting dims in response to daylight being available, then in areas with adequate daylight $F_d = 0.8$. This may be taken as all areas within 6m of a window wall or in areas where 10% or more of the roof is translucent or made up of rooflights.

Step 6: Determine the constant illuminance factor (F_c) – Systems that control the lighting in this way have $F_c = 0.9$, and those that do not have $F_c = 1$.

Step 7: Calculate the daytime energy use (E_d) – The daytime energy use is:

$$E_d(\%) = \frac{P_l \times F_o \times F_d \times F_c \times T_d}{1000}$$

Step 8: Calculate the night-time energy use (E_n) – The night-time energy use is:

$$E_n(\%) = \frac{P_l \times F_o \times F_c \times T_n}{1000}$$

Step 9: Calculate total energy (kWh) per square metre per year (LENI) – The total energy per square metre per year is the sum of the daytime, night-time and parasitic energy uses per year divided by the area (A), as set out below:

$$LENI\ (\%) = \frac{E_p + E_d + E_n}{A}$$

Table B1 Recommended maximum LENI (kWh per square metre per year) in new and existing buildings

Hours			Illuminance (lux)								Display lighting	
Total	Day	Night	50	100	150	200	300	500	750	1000	Normal	Shop window
1000	821	179	0.69	0.68	2.57	3.00	3.96	5.93	8.83	12.59	2.50	
1500	1277	223	1.04	0.98	3.05	3.68	5.10	8.00	12.33	17.98	3.75	
2000	1726	274	1.39	1.28	3.54	4.37	6.26	10.10	15.85	23.40	5.00	
2500	2164	336	1.73	1.60	4.04	5.07	7.43	12.23	19.41	28.85	6.25	
3000	2585	415	2.08	1.93	4.56	5.81	8.64	14.41	23.04	34.36	7.50	
3700	3133	567	2.56	2.42	5.34	6.90	10.42	17.59	28.27	42.22	9.25	
4400	3621	779	3.05	2.97	6.20	8.08	12.33	20.95	33.73	50.27	11.00	24.20
5400	4184	1216	3.74	3.87	7.58	9.98	15.32	26.16	42.02	62.24	13.50	
6400	4547	1853	4.44	4.94	9.22	12.19	18.73	31.99	51.06	74.87	16.00	
8760	4380	4380	6.07	8.36	14.33	18.99	28.89	48.85	76.21	108.14	21.90	48.18

Appendix D: Measures for consequential improvements

D1 For an existing building with a total useful floor area of over 1000m2, additional work may be required to improve the overall energy efficiency of the building if proposed work consists of or includes any of the following.
(a) An extension.
(b) Providing any fixed building service in the building for the first time.
(c) Increasing the capacity of any fixed building service (which does not include doing so on account of renewable technology).

D2 Additional works to improve energy efficiency as required in these circumstances are known as consequential improvements and are described in detail in Section 12.

Measures usually to be installed whenever consequential improvements are required

D3 Energy efficiency improvements to the building are required whenever consequential improvements apply. All technically, functionally and economically feasible measures should be implemented, with the requirement for consequential improvements being met based on the value of the principal works in some circumstances. This is outlined in Section 12.

D4 The energy efficiency improvements in Table D1 can be considered technically, functionally and economically feasible in normal circumstances. As such, these measures should usually be installed when consequential improvements are required. These should be installed at least to the extent outlined in Table D1, based on the value of the principal works, as outlined in Section 12.

Table D1 – ***Energy efficiency measures which should usually be installed whenever consequential improvements are required. These measures are considered technically, functionally and economically feasible in normal circumstances.*** *These measures should be installed at least to the extent outlined to meet the reasonable provision criterion, based on the value of the principal works, as outlined in Section 12.*
(4) Upgrading general lighting systems that have an average lamp efficacy of less than 60 light source lumens per circuit-watt and that serve areas greater than 100m^2 by providing new luminaires and/or controls following the guidance in Section 6.
NOTE: *Items 1 to 7 usually meet the economic feasibility criterion of a simple payback of 15 years. A shorter simple payback period of 7 years is given for item 8 because such measures are likely to be more capital intensive or more risky than the others*

Additional measures usually to be installed when consequential improvements are required following changes to fixed building service provision.

D5 When consequential improvements apply as a result of providing a fixed building service in the building for the first time or increasing the capacity of an existing fixed building service, additional energy efficiency improvements to those parts of the building served by the service should be made. The extent of these measures should not be based on the value of the principal works, as outlined in Section 12. All technically, functionally, and economically feasible measures to improve the parts of the building served by the service to meet the requirements of Part L should be implemented.

D6 The measures in Table D2 improve the energy efficiency of those parts of the building served by the service, and can be considered technically, functionally and economically feasible in normal circumstances whenever these additional measures are required.

Table D2 – ***Additional energy efficiency measures which should usually be installed whenever consequential improvements apply as a result of, (i) the provision of a fixed building service in the building for the first time, or (ii) increasing the capacity of any fixed building service.*** *These measures are considered technically, functionally and economically feasible in normal circumstances.* *The extent of these measures should not be based on the value of the principal works, as outlined in Section 12, and should be installed in so far as they are technically, functionally and economically feasible.*
(3) Any general lighting system within the area served by the relevant fixed building service that has an average efficacy of less than 60 light source lumens per circuit-watt should be upgraded with new luminaires and/or controls following the guidance in Section 6.

TECHNICAL STATEMENT

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WALES

The Government in Wales has published the latest version of the Building Regulations 2010 for Wales – Approved Document L, on the Conservation of Fuel and Power – Volume 1: Dwellings and Volume 2: Buildings other than dwellings. These were published on the 29th September 2022 in two separate documents.

The Building Regulations 2010
Approved Document L
Conservation of Fuel and Power
Volume 1:
Dwellings
(2022 edition – for use in Wales)

The Building Regulations 2010
Approved Document L
Conservation of Fuel and Power
Volume 2:
Buildings other than dwellings
2022 edition – for use in Wales)

These approved documents support Part L of Schedule 1 to the Building Regulations 2010.
These approved documents take effect on **23rd November 2022** (Volume 1) or **29th March 2022** (Volume 2) for use in **Wales**.
It does not apply to work on a particular building where a building notice, full plans application or initial notice have been submitted before that date, provided the work for each building is started before **23rd November 2023** (Volume 1) or **29th March 2024** (Volume 2) and it does not apply to sites where a building notice, initial notice or full plans application were submitted before 31st July 2014 and building work commenced before 31st July 2015.

The Building Regulations 2010 – Approved Document L – Conservation of Fuel and Power Volume 1: Dwellings

The Building Regulations 2010 – Approved Document L – Conservation of Fuel and Power Volume 2: Buildings other than dwellings

Schedule 1 – Part L Conservation of fuel and power
L1. Reasonable provision shall be made for the conservation of fuel and power in buildings by:
(a)
(b) providing fixed building services which:
(i) are energy efficient to a reasonable standard
(ii) have effective controls; and
(iii) are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances.

The Building Regulations 2010 – Approved Document L – Conservation of Fuel and Power Volume 1: Dwellings

Lighting

6.57 Any fixed lighting should achieve lighting levels appropriate to the activity in the space and spaces should not be over-illuminated. **Note:** In many cases, it is likely that householders will be able to choose the lamp installed in the individual space.

6.58 Where installed in a new or existing dwelling, each internal light fitting should have lamps with a minimum luminous efficacy of 75 light source lumens per circuit-watt.

6.59 Where installed in a new or existing dwelling, internal light fittings should have local controls to allow for the separate control of lighting in each space or zone. Controls may be manual, automatic or a combination of both.

6.60 Where installed in a new or existing dwelling, fixed external lighting should have both of the following controls.
a. Automatic controls which switch luminaires off in response to daylight.
b. If luminous efficacy is 75 light source lumens per circuit-watt or less, automatic controls which switch luminaires off after the area lit becomes unoccupied. If luminous efficacy is greater than 75 light source lumens per circuit-watt, manual control is acceptable.

Building automation and control systems

6.61 Where a building automation and control system is installed, it should have appropriate control capabilities for the dwelling, based on the type of building, its expected use and potential energy savings.

6.62 The system should be specified and installed according to the manufacturer's instructions to ensure that its overall performance meets a reasonable standard.

6.63 For large or complex buildings, the guidance in **Approved Document L, Volume 2: Buildings other than dwellings** should be followed.

The Building Regulations 2010 – Approved Document L – Conservation of Fuel and Power Volume 2: Buildings other than dwellings

System specific guidance – Lighting

6.59 Fixed lighting should achieve levels of illumination appropriate to the activity in the space. Spaces should not be over-illuminated. Lighting should be designed based on CIBSE's *SLL Lighting Handbook* or an equivalent design guide.

Note: For smaller spaces where total lighting power is likely to be low (toilets, store rooms etc.) there is no expectation that lighting calculations should be produced.

6.60 a. If it is general lighting, either:
- i. have an average luminaire efficacy of 95 luminaire lumens per circuit-watt
- ii. the Lighting Energy Numeric Indicator (LENI) method, following Appendix B.

b. If it is display lighting, any of the following:
- i. have an average light source efficacy of 80 light source lumens per circuit-watt
- ii. have a rated power usage no greater than 0.30W/m^2 in each space
- iii. the Lighting Energy Numeric Indicator (LENI) method, following Appendix B.

c. For high excitation purity light sources, an average light source efficacy of 65 light source lumens per circuit-watt

Note: This approved document does not include minimum standards for specialist lighting, such as theatrical spotlights, stage lighting, gobo projectors or wall-washers.

6.61 General lighting and display lighting should be metered by one of the following methods:
a. dedicated lighting circuits with kWh meter for each circuit.
b. local power meter coupled to or integrated in the lighting controllers of a lighting management system.
c. a lighting management system that can both:
- i. calculate the consumed energy.
- ii. make this information available to a building management system.

Lighting controls

6.62 Lighting controls in new and existing buildings should follow guidance in the Building Research Establishment's *Digest 498.*

6.63 Unoccupied spaces should have automatic controls to turn the general lighting off when the space is not in use (e.g. through presence detection). Occupied spaces should have automatic controls where suitable for the use of the space.

6.64 General lighting in occupied spaces should have daylight controls (e.g. photo-switching and dimming) for parts of the space which are likely to receive high levels of natural light.

6.65 Display lighting should be controlled on dedicated circuits that can be switched separately from those for lighting provided for general illuminance.

Building automation and control systems

6.66 If a new building has a space heating or air-conditioning system with an effective rated output of greater than 290 kW, a Building Automation and Control System must be installed.

6.67 If an existing building has a space heating or air-conditioning system with an effective rated output greater than 290kW, a Building Automation and Control System being replaced or installed should follow paragraphs 6.72 to 6.73.

Note: The requirements in paragraphs 6.66 and 6.67 also apply to buildings containing heating and air-conditioning systems which are combined with ventilation systems.

6.68 For building systems that do not satisfy paragraph 6.66 or 6.67, consideration should be given to providing centralised controls to allow the facilities manager to switch off appliances when they are not needed. Where appropriate, these should be automated (with manual override) so that energy savings are maximised. Consideration should be given to the power requirements of essential (e.g., life safety) systems.

Appendix B: Lighting Energy Numeric Indicator (LENI)

B1 The Lighting Energy Numeric Indicator (LENI) method is an alternative approach for complying with the standards for lighting given in Section 6 of this approved document.

B2 The LENI should not exceed the lighting energy limit specified in Table B1 for a given illuminance and number of hours run.

Step 1: Determine the lighting energy limit from Table B1. If display lighting is used, the lighting energy limit may be increased by the value given for normal display lighting for the area of the room where display lighting is used.

Step 2: Calculate the parasitic energy use (E_p) – If the parasitic energy use is unknown, an allowance of 0.3W/m^2 should be made for any control system. If no lighting control system is used, then $E_p = 0$.

Step 3: Determine the total power of lighting (P_l).

Step 4: Determine the occupancy factor (F_o) – If no automatic control is used, then $F_o = 1$. If controls turn off the lights within 20 minutes of the room being empty, then $F_o = 0.8$.

Step 5: Determine the factor for daylight (F_d) – If no daylight-linked dimming system is used, then $F_d = 1$. If the electric lighting dims in response to daylight being available, then in areas with adequate daylight $F_d = 0.8$. This may be taken as all areas within 6m of a window wall or in areas where 10% or more of the roof is translucent or made up of rooflights.

Step 6: Determine the constant illuminance factor (F_c) – Systems that control the lighting in this way have $F_c = 0.9$, and those that do not have $F_c = 1$.

Step 7: Calculate the daytime energy use (E_d) – The daytime energy use is:

$$E_d(\%) = \frac{P_l \times F_o \times F_d \times F_c \times T_d}{1000}$$

Step 8: Calculate the night-time energy use (E_n) – The night-time energy use is:

$$E_n(\%) = \frac{P_l \times F_o \times F_c \times T_n}{1000}$$

Step 9: Calculate total energy (kWh) per square metre per year (LENI) – The total energy per square metre per year is the sum of the daytime, night-time and parasitic energy uses per year divided by the area (A), as set out below:

$$LENI\ (\%) = \frac{E_p + E_d + E_n}{A}$$

Table B.1 Recommended maximum LENI (kWh per square metre per year) in new and existing buildings

Hours			Illuminance (lux)								Display lighting	
Total	Day	Night	50	100	150	200	300	500	750	1000	Normal	Shop window
1000	821	179	0.69	0.68	2.57	3.00	3.96	5.93	8.83	12.59	2.50	
1500	1277	223	1.04	0.98	3.05	3.68	5.10	8.00	12.33	17.98	3.75	
2000	1726	274	1.39	1.28	3.54	4.37	6.26	10.10	15.85	23.40	5.00	
2500	2164	336	1.73	1.60	4.04	5.07	7.43	12.23	19.41	28.85	6.25	
3000	2585	415	2.08	1.93	4.56	5.81	8.64	14.41	23.04	34.36	7.50	
3700	3133	567	2.56	2.42	5.34	6.90	10.42	17.59	28.27	42.22	9.25	
4400	3621	779	3.05	2.97	6.20	8.08	12.33	20.95	33.73	50.27	11.00	24.20
5400	4184	1216	3.74	3.87	7.58	9.98	15.32	26.16	42.02	62.24	13.50	
6400	4547	1853	4.44	4.94	9.22	12.19	18.73	31.99	51.06	74.87	16.00	
8760	4380	4380	6.07	8.36	14.33	18.99	28.89	48.85	76.21	108.14	21.90	48.18

Appendix D: Measures for consequential improvements

D1 Consequential improvements describe additional energy efficiency improvements that should be undertaken when the following buildings works are undertaken:

a. The existing building is extended, or part of the building is converted to provide fixed heating in a previously unheated space, increasing the conditioned volume. The building could be extended by means of a conventional extension or a non-exempt conservatory or porch.

b. the initial provision of any fixed building service i.e. the initial installation of heating, hot water, air conditioning or mechanical ventilation, or internal or external lighting (not including emergency escape lighting or specialist process lighting), or

c. an increase in the installed capacity of any fixed building service (other than renewable energy generators)

The requirement in item (a) applies to all existing non-domestic buildings. The requirements in items (b) and (c) only apply to existing non-domestic buildings where the total useful floor area is over 1000m2.

D.2 Additional works to improve energy efficiency as required in these circumstances are known as consequential improvements and described in detail in **Section 12**.

Measures usually to be installed whenever consequential improvements are required

D.3 Energy efficiency improvements to the rest of the building are required whenever consequential improvements apply. All technically, functionally and economically feasible measures should be implemented, with the requirement for consequential improvements being met based on the value of the principal works in some circumstances. This is outlined in **Section 12.**

D.4 The energy efficiency improvements in Table D.1 can be considered technically, functionally and economically feasible in normal circumstances. As such, these measures should usually be installed when consequential improvements are required. These should be installed at least to the extent outlined in Table D.1, based on the value of the principal works, as outlined in **Section 12.**

Table D.1 Energy efficiency measures which should usually be installed whenever consequential improvements are required.

These measures are considered technically, functionally, and economically feasible in normal circumstances.
These measures should be installed at least to the extent outlined to meet the reasonable provision criterion, based on the value of the principal works, as outlined in **Section 12**.

Item	Improvement measure
4	Upgrading general lighting systems that have an average lamp efficacy of less than 60 light source lumens per circuit-watt and that serve areas greater than 100 m^2 by providing new luminaires and/or controls following the guidance in **Section 6**.
NOTE: *Items 1 to 7 usually meet the economic feasibility criterion of a simple payback of 15 years. A shorter simple payback period of 7 years is given for item 8 because such measures are likely to be more capital intensive or more risky than the others*	

Additional measures usually to be installed when consequential improvements are required following changes to fixed building service provision.

D.5 When consequential improvements apply as a result of the provision of a fixed building service in the building for the first time, or increasing the capacity of any fixed building service, additional energy efficiency improvements to those parts of the building served by the service should be made. The extent of these measures should be based on the value of the principal works as outlined in **Section 12.** All technically, functionally and economically feasible measures to improve the fabric of the building served by the service to meet the requirements of Part L should be implemented.

The measures in Table D.2 improve the energy efficiency of those parts of the building served by the service, and can be considered technically, functionally, and economically feasible in normal circumstances whenever these additional measures are required.

Table D.2 Additional energy efficiency measures which should usually be installed whenever consequential improvements apply as a result of:

- the provision of a fixed building service in the building for the first time, or
- or increasing the capacity of any fixed building service.

These measures are considered technically, functionally, and economically feasible in normal circumstances.
The extent of these measures should not be based on the value of the principal works, as outlined in **Section 12**, and should be installed in so far as they are technically, functionally, and economically feasible.

3	Any general lighting system within the area served by the relevant fixed building service that has an average efficacy of less than 60 light source lumens per circuit-watt should be upgraded with new luminaires and/or controls following the guidance in **Section 6**.

TECHNICAL STATEMENT

FOR LIA MEMBER USE ONLY

SCOTLAND

The Scottish Government has published both interim versions, and latest versions of the Building Standards for Scotland, which are a collection of building standards guidance publications. The current Technical Handbook documents are for use from the 1st February 2023 until the 4th June 2023, and the later Technical Handbook documents are for use from the 5th June 2023, and are published in Domestic and Non-Domestic versions, alongside the Building Standards Division Compliance Guides for Scotland, also published in Domestic and Non-Domestic versions.

The Scottish Government

Building Standards Division

Domestic Technical Handbook
June 2023

Domestic Compliance Guide for Scotland
2022 + V1.1

The Scottish Government

Building Standards Division

Non-Domestic Technical Handbook
June 2023

Domestic Compliance Guide for Scotland
2022 + V1.1

These Technical Handbook documents, shown above, relate to designers seeking to comply with the standards or to submit a building warrant on or after the 5th June 2023, and the Building Standards Division Compliance Guides are for use on or after the 1st February 2023.

Building Standards Division - Technical Handbook – Domestic – Energy (Edition from 5th June 2023)

6.5 Artificial and display lighting - Mandatory Standard

Standard 6.5

Every building must be designed and constructed in such a way that the artificial or display lighting installed is energy efficient and is capable of being controlled to achieve optimum energy efficiency.

Limitation:
This standard does not apply to:
a) process and emergency lighting components in a building, or
b) alterations in dwellings or a building ancillary to a dwelling.

6.5.0 Introduction

Artificial lighting can account for a substantial proportion of the electricity used within a building. Appropriate lighting design (including use of natural daylight) can reduce energy demand, emissions and running costs. A limit for energy use arising from fixed lighting is included in the notional building specification for new dwellings under standard 6.1. Lighting in all buildings should be provided to meet the needs of occupants based upon the activities undertaken in different areas of the dwelling.

Conversions - in the case of conversions, as specified in regulation 4, the building as converted shall meet the requirements of this standard in so far as is reasonably practicable, and in no case be worse than before the conversion (regulation 12, schedule 6).

6.5.1 Fixed lighting

Guidance on the efficiency of fixed internal and external lighting is given in section 13 of the Domestic Building Services Compliance Guide for Scotland. The document replicates guidance published in support of building standards elsewhere in the UK and supports standardisation of the specification and expected performance of fixed building services throughout the UK. The guidance applies to new systems and replacement, in whole or in part, of existing systems. It also addresses improvement work to existing systems as a consequence of replacing components.

Common Areas of domestic buildings – lighting levels and controls to enable the safe use of lighting in common areas such as corridors, stairs, and other circulation areas, are identified in clause 4.6.2 within Section 4.

Domestic Building Services Compliance Guide for Scotland (2022 Edition – V1.1 – February 2023)

Section 13: Lighting

13.1 Scope of guidance

This section provides guidance on the specification of fixed internal and external lighting for new and existing dwellings to meet relevant energy efficiency requirements in the building regulations.

13.2 Key terms

Fixed external lighting means lighting fixed to an external surface of the dwelling supplied from the occupier's electrical system. It excludes lighting in common areas of blocks of flats and in other communal accessways.

Circuit-watt means the power consumed in lighting circuits by lamps and, where applicable, their associated control gear (including transformers and drivers) and power factor correction equipment.

Light fitting means a fixed light or lighting unit that can comprise one or more lamps and lampholders, control gear and an appropriate housing. The control gear may be integrated in the lamp or located elsewhere in or near to the fixed light.

13.3 Internal and external lighting

Any fixed lighting should be designed to achieve lighting levels appropriate to the activity in the space. Light fittings may be either:

• dedicated fittings which will have separate control gear and will take only low energy lamps (e.g. pin based fluorescent or compact fluorescent lamps); or

• standard fittings supplied with low energy lamps with integrated control gear (e.g. bayonet or Edison screw base compact fluorescent lamps).

In many cases, it is likely that householders will be able to choose the lamp installed in the individual space, however, where fixed lighting is provided, spaces should be within an illuminance range recommended in design guidance and should not be over-illuminated.

Fixed internal lighting - All internal light fittings to have minimum luminous efficacy of 75 lamp lumens per circuit watt. Local controls for separate control of each space or zone. Controls may be automatic, manual or a combination of both.

Fixed external lighting - Where fixed external lighting is installed, provide light fittings with the following characteristics:

• Automatic controls to switch off the luminaires in response to daylight.

• If the lamp efficacy is 75 lamp lumens per circuit watt or less external light fittings should have automatic controls which switch luminaires off in response to occupancy, otherwise manual control is acceptable.

TECHNICAL STATEMENT

FOR LIA MEMBER USE ONLY

Building Standards Division - Technical Handbook – Non-Domestic – Energy (Edition from 5th June 2023)

6.5 Artificial and display lighting - Mandatory Standard

Standard 6.5

Every building must be designed and constructed in such a way that the artificial or display lighting installed is energy efficient and is capable of being controlled to achieve optimum energy efficiency.

Limitation:
This standard does not apply to:
a) process and emergency lighting components in a building, or
b) alterations in dwellings or a building ancillary to a dwelling.

6.5.0 Introduction

Artificial and display lighting can account for a substantial proportion of the electricity used within a building. Appropriate lighting design (including daylighting) can not only reduce CO2 emissions and associated running costs, but also reduce internal heat gains and lessen any need for mechanical cooling.
There are issues which go beyond the guidance that designers may wish to consider:
• when designing a lighting system consideration should be given to the advances in lighting technology, particularly with light emitting diodes technology (LED), and
• the system design should accommodate future upgrading with minimal disruption to the building fabric and services.

Conversions - in the case of conversions, as specified in regulation 4, the building as converted shall meet the requirements of this standard in so far as is reasonably practicable, and in no case be worse than before the conversion (regulation 12, schedule 6).

6.5.1 Lighting efficiency and controls

Guidance on the efficiency of fixed internal and external lighting is given in the Non- domestic Building Services Compliance Guide for Scotland.
The document replicates guidance published in support of building standards elsewhere in the UK and supports standardisation of the specification and expected performance of fixed building services throughout the UK. The guidance applies to new systems and replacement, in whole or in part, of existing systems. It also addresses improvement work to existing systems as a consequence of replacing components. Clause 6.5.2 provides information on situations not addressed in that document.

6.5.2 Consequential improvement

Where work to an existing building is subject to a building warrant and includes the provision of new fixed building services or alters or extends the capacity of existing fixed building services, the opportunity should be taken to review and improve the performance of fixed building systems.
Guidance on the extent to which improvement should be made is given in Annex 6.C – 'Improvement to the energy performance of existing building services when carrying out building work'.

TECHNICAL STATEMENT

FOR LIA MEMBER USE ONLY

Non-Domestic Building Services Compliance Guide for Scotland (2022 Edition – V1.1 – February 2023)

Section 12: Lighting

12.1 Introduction

This section provides guidance on specifying lighting for new and existing non-domestic buildings to meet relevant energy efficiency requirements in the building regulations. There are two alternative approaches, applicable both to systems in new buildings and to replacement systems in existing buildings.

The guidance in this section applies to the following types of lighting:

- general interior lighting
- display lighting.

12.2 Key terms

Absence detection is a type of control which switches the lighting off, or dims it down, after the space becomes unoccupied, but where switching on is done manually.

Circuit-watt is the power consumed in lighting circuits by lamps and, where applicable, their associated control gear (including transformers and drivers) and power factor correction equipment.

High excitation purity light sources are colour-tuneable light sources that can be set to at least the colours listed below and which have for each of these colours, measured at the dominant wavelength, the minimum excitation purity shown. Intended for use in applications requiring high-quality coloured light. ***Lamp lumens*** means the sum of the average initial (100 hour) lumen output of all the lamps in the luminaire.

Colour	Dominant wavelength (nm)	Minimum excitation of purity (%)
Blue	440-490	90
Green	520-570	65
Red	610-670	95

Lamp lumens per circuit-watt is the total *lamp lumens* summed for all luminaires in the relevant areas of the building, divided by the total circuit-watts for all the luminaires.

Light source lumens are the sum of the average initial (100 hour) lumen output of all the light sources in a luminaire. This does not include any losses or inefficiencies of the luminaire.

LOR is the light output ratio of the luminaire, which means the ratio of the total light output of the luminaire under stated practical conditions to that of the lamp or lamps contained in the luminaire under reference conditions.

Luminaire lumens per circuit-watt is the (*lamp lumens* x *LOR*) summed for all luminaires in the relevant areas of the building, divided by the total *circuit-watts* for all the luminaires.

LENI (Lighting Energy Numerical Indicator) is a measure of the performance of lighting in terms of energy per square metre per year (kWh/m^2/year), based on BS EN 15193:2007 – 'Energy performance of buildings. Energy requirements for lighting'.

Presence detection is a type of control which switches the lighting on when someone enters a space, and switches it off, or dims it down, after the space becomes unoccupied.

12.3 Lighting in new and existing buildings

Lighting should be designed to achieve lighting levels appropriate to the activity in the space, based on the CIBSE SLL Lighting Handbook or an equivalent design guide. Spaces should be within the recommended illuminance range and should not be over-illuminated.
In smaller spaces, where total lighting power is likely to be low (toilets, storerooms, etc.) there is no expectation that lighting calculations should be produced.

General Lighting - efficacy
General lighting should have an average luminaire efficacy of 95 luminaire lumens per circuit-watt or demonstrate an equivalent efficacy using the Lighting Energy Numeric Indicator (LENI) method (see section 12.4).

Display Lighting - efficacy
Display lighting should have either:
- an average light source efficacy of 80 light source lumens per circuit-watt
- a rated power usage no greater than 0.3 W/m² in each space
- the LENI method, following advice in section 12.4.

High excitation purity light sources should have an average light source efficacy of 65 light source lumens per circuit-watt.

Lighting controls
Lighting controls in new and existing buildings should follow the guidance in BRE Digest 498 – "Selecting lighting controls".
Unoccupied spaces should have automatic controls to turn the general lighting off when the space is not in use (e.g., through presence or absence detection). Occupied spaces should have automatic controls where suitable for the use of the space.
General lighting in occupied spaces should have daylight controls (e.g., photo-switching and dimming) for parts of the space which are likely to receive high levels of natural light.
Display lighting, where provided, should be controlled on dedicated circuits that can be switched off at times when it is not needed for the purpose for which it is provided.

Lighting metering - The lighting should be metered to record its energy consumption in accordance with the minimum standards in Table 28.

Table 28: Recommended minimum standards for metering of general and display lighting in new and existing buildings

	Metering solution
Metering for general or display lighting	Either: • kWh meters on dedicated lighting circuits in the electrical distribution; or • local power meter coupled to or integrated in the lighting controllers of a lighting or building management system; or • a lighting management system that can calculate the consumed energy and make this information available to a building management system or in an exportable file format. (This could involve logging the hours run and the dimming level, and relating this to the installed load).

12.4 Lighting Energy Numerical Indicator (LENI)

An alternative to complying via a minimum efficacy level in Section 12.3 is to follow the Lighting Energy Numerical Indicator (*LENI*) method. The *LENI* method calculates the performance of lighting in terms of energy per square metre per year. The approach described below must be followed in calculating the *LENI* for a lighting scheme. The *LENI* should not exceed the lighting energy limit specified in Table 44 for a given illuminance and hours run.

Design the lighting.

The first step to energy efficient lighting is to design the lighting installation in a way that meets all of the users' needs for the space under consideration. Recommendations for appropriate illuminance values and other lighting requirements may be found in BS EN 12464-1 and in the Society of Light and Lighting (SLL) Code for Lighting. The SLL Handbook provides practical advice on how to design lighting for a number of different applications.

Step 1 - Determine the lighting energy limit – from Table 29.

If display lighting is used, then the lighting energy limit may be increased by the value given for normal display lighting for the area of the room where display lighting is used.

Step 2 - Calculate the parasitic energy use (E_p)

If the parasitic energy use is unknown, an allowance of 0.3 W/m^2 should be made for any control system. If no lighting control system is used, then $E_p = 0$.

Step 3 - Determine the total power of lighting (P_l)

This is the total power in watts consumed by the luminaires within a space.

Step 4 - Determine the occupancy factor (F_o)

If no automatic control is used, then $F_o = 1$. If controls turn off the lights within 20 minutes of the room being empty, then $F_o = 0.8$.

Step 5 - Determine the factor for daylight (F_d)

If no daylight-linked dimming system is used, then $F_d = 1$. If the electric lighting dims in response to daylight being available, then in areas with adequate daylight $F_d = 0.8$. This may be taken as all areas within 6 m of a window wall or in areas where 10% or more of the roof is translucent or made up of rooflights.

Step 6 - Determine the constant illuminance factor (F_c)

Systems that control the lighting in this way have $F_c = 0.9$, and those that do not have $F_c = 1$.

Step 7 - Determine the daytime energy use (E_d)

The daytime energy use is:

$$E_d(\%) = \frac{P_l \times F_o \times F_d \times F_c \times T_d}{1000}$$

Step 8 - Determine the night-time energy use (E_n)

The night-time energy use is:

$$E_n(\%) = \frac{P_l \times F_o \times F_c \times T_n}{1000}$$

Step 9 - Calculate total energy (kWh) per square metre per year (LENI)

The total energy per square metre per year is the sum of the daytime, night- time and parasitic energy uses per year divided by the area (A), as set out in the formula below:

$$\text{LENI (\%)} = \frac{E_p + E_d + E_n}{A}$$

Table 29: Recommended maximum LENI (kWh per square metre per year) in new and existing buildings

Hours			Illuminance (lux)								Display Lighting	
Total	Day	Night	50	100	150	200	300	500	750	1000	Normal	Shop Window
1000	821	179	0.69	0.68	2.57	3.00	3.96	5.93	8.83	12.59	2.50	
1500	1277	223	1.04	0.98	3.05	3.68	5.10	8.00	12.33	17.98	3.75	
2000	1726	274	1.39	1.28	3.54	4.37	6.26	10.10	15.85	23.40	5.00	
2500	2164	336	1.73	1.60	4.04	5.07	7.43	12.23	19.41	28.85	6.25	
3000	2585	415	2.08	1.93	4.56	5.81	8.64	14.41	23.04	34.36	7.50	
3700	3133	567	2.56	2.42	5.34	6.90	10.42	17.59	28.27	42.22	9.25	
4400	3621	779	3.05	2.97	6.20	8.08	12.33	20.95	33.72	50.27	11.00	24.20
5400	4184	1216	3.74	3.87	7.58	9.98	15.32	26.16	42.02	62.24	13.50	
6400	4547	1853	4.44	4.94	9.22	12.19	18.73	31.99	51.06	74.87	16.00	
8760	4380	4380	6.07	8.36	14.33	18.99	28.89	48.85	76.22	108.14	21.90	48.18

TECHNICAL STATEMENT

FOR LIA MEMBER USE ONLY

NORTHERN IRELAND

The Northern Ireland Building Regulations are legal requirements made by the Department of Finance and administered by 11 District Councils. The Regulations are intended to ensure the safety, health, welfare, and convenience of people in and around buildings, and are designed to further the conservation of fuel and energy. These Technical Booklets, F1 and F2, took effect on the 30th June 2022, part of a series that has been prepared by the Department of Finance (the Department) for the purpose of providing practical guidance with respect to the technical requirements of the Building Regulations (Northern Ireland) 2012 (as amended) (the Building Regulations).

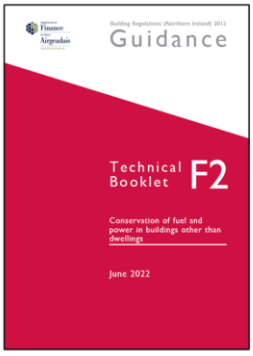
The Building Regulations (Northern Ireland) 2012

Guidance

Technical Booklet F1

Conservation of Fuel and Power in dwellings

June 2022



The Building Regulations (Northern Ireland) 2012

Guidance

Technical Booklet F2

Conservation of Fuel and Power in buildings other than dwellings

June 2022

The Building Regulations (Northern Ireland) 2012 – Guidance

Technical Booklet F1 – Conservation of Fuel and Power in dwellings (June 2022)

PART F

Conservation of fuel and power

Application and interpretation38.
(1) Subject to paragraphs (2), (3) and (4) this Part shall apply to any building and where a building contains one or more dwellings to each dwelling separately.

Definitions
1.2 In this Technical Booklet the following definitions apply –

Building work – is defined in regulation 2 in Part A of the Building Regulations.

Dwelling – is defined in regulation 2 in Part A of the Building Regulations

Use of England & Wales documents
1.10 Where the *Domestic Building Services Compliance Guide* refers to Part L (Conservation of fuel and power) of the building regulations for England & Wales and associated Approved Documents L1A and L1B, it should be read as referring to the corresponding references in Part F (Conservation of fuel and power) of the Building Regulations (Northern Ireland) 2012 and this Technical Booklet.

Internal lighting
2.30 In all cases the DER should be calculated assuming the proportion of low-energy lamps as actually installed in the fixed lighting locations.
2.31 The number of low-energy lamps that would be reasonable is given in the *Domestic Building Services Compliance Guide*.

Fixed building service systems
2.49 Every fixed building service, including its controls and installation, should be at least as efficient as the minimum acceptable efficiency for that particular type of appliance or fitting given in the *Domestic Building Services Compliance Guide*.

2.51 The efficiency claimed for the fixed building service should be based on the appropriate test standard given in the *Domestic Building Services Compliance Guide* and the test data should be certified by an appropriate independent body. Where a particular technology is not covered by this guide, it should be demonstrated that the proposed technology has a performance that is equivalent to a reference system of the same type whose details are given in this guide.

Commissioning of fixed building services
3.39 The fixed building services should be commissioned by testing and adjustment as necessary to ensure that they use no more fuel and power than is reasonable in the circumstances.

CONSEQUENTIAL IMPROVEMENTS

General
3.63 Consequential improvements should be made to any existing building having a total useful floor area greater than 1000 m^2, where any of the following apply –
(a) it is extended; or
(b) any fixed building service (other than a renewable energy generator) is installed for the first time; or
(c) an existing fixed building service (other than a renewable energy generator) is increased in capacity.

3.64 Consequential improvements need only be carried out where they are technically, functionally, and economically feasible.

3.65 Only a very small number of existing dwellings will exceed 1000 m^2 in size. Where consequential improvements are required, suitable guidance is given in Technical Booklet F2: Conservation of fuel and power in buildings other than dwellings.

Domestic Building Services Compliance Guide - 2010 Edition

12.3 Internal and external lighting

Fixed internal and external lighting should meet the minimum standards for efficacy and controls in Table 40.

Table 40: Recommended minimum standards for fixed internal and external lighting

Lighting	New and replacement systems	Supplementary information
Fixed internal lighting	a. In the areas affected by the building work, provide low energy ***light fittings*** (fixed lights or lighting units) that number not less than three per four of all the ***light fittings*** in the main dwelling spaces of those areas (excluding infrequently accessed spaces used for storage, such as cupboards and wardrobes). b. Low energy ***light fittings*** should have lamps with a luminous efficacy greater than 45 lamp lumens per circuit-watt and a total output greater than 400 lamp lumens. c. ***Light fittings*** whose supplied power is less than 5 circuit-watts are excluded from the overall count of the total number of light fittings.	*__Light fittings__ may be either:* • *dedicated fittings which will have separate control gear and will take only low energy lamps (e.g. pin based fluorescent or compact fluorescent lamps); or* • *standard fittings supplied with low energy lamps with integrated control gear (e.g. bayonet or Edison screw base compact fluorescent lamps).* *__Light fittings__ with GLS tungsten filament lamps or tungsten halogen lamps would not meet the standard.* *The Energy Saving Trust publication GIL 20, "Low energy domestic lighting", gives guidance on identifying suitable locations for fixed energy efficient lighting.*
Fixed external lighting	Where fixed external lighting is installed, provide ***light fittings*** with the following characteristics: a. Either: i. lamp capacity not greater than 100 lamp-watts per light fitting; and ii. all lamps automatically controlled so as to switch off after the area lit by the fitting becomes unoccupied; and iii. all lamps automatically controlled so as to switch off when daylight is sufficient. b. Or i. lamp efficacy greater than 45 lumens per circuit-watt; and ii. all lamps automatically controlled so as to switch off when daylight is sufficient; and iii. light fittings controllable manually by occupants.	

Table 40: Recommended minimum standards for fixed internal and external lighting *(continued)*

British Standards
BS EN 15193:2007 "Energy performance of buildings – Energy requirements for lighting".

Other related documents
CE80 "Domestic lighting innovations", Energy Efficiency Best Practice in Housing.
CE61 "Energy efficient lighting – guidance for installers and specifiers", Energy Saving Trust.
EP84 "Housing for people with sight loss", Thomas Pocklington Trust Design Guide.
IP412 "Making the most of your sight: Improve the lighting in your home", RNIB and Thomas Pocklington Trust.

Energy Saving Trust best practice standards
The Energy Saving Trust sets best practice "Energy Saving Recommended (ESR)" standards for lamps that cover not only energy efficiency, but also other aspects of quality including colour rendering, warm-up time, product life and power factor. It is advisable to install only ESR low energy lamps in dwellings.

The Building Regulations (Northern Ireland) 2012 – Guidance

Technical Booklet F2 – Conservation of Fuel and Power in buildings other than dwellings (June 2022)

PART F

Conservation of fuel and power

Application and interpretation38.
(1) Subject to paragraphs (2), (3) and (4) this Part shall apply to any building and where a building contains one or more dwellings to each dwelling separately.

Definitions
1.2 In this Technical Booklet the following definitions apply –

Building work – is defined in regulation 2 in Part A of the Building Regulations.

Display lighting – lighting intended to highlight displays of exhibits or merchandise, or lighting used in spaces for public leisure and entertainment such as auditoria, cinemas, conference halls, dance halls and restaurants.

Emergency escape lighting – that part of emergency lighting that provides illumination for the safety of people leaving an area or attempting to terminate a dangerous process before leaving an area.

Energy efficiency requirements – is defined in regulation 38 in Part F of the Building Regulations.

Exempted building – is defined in regulation 2 in Part A of the Building Regulations.

Fixed building service – is defined in regulation 2 in Part A of the Building Regulations.

Specialist process lighting – lighting intended to illuminate specialist tasks within a space, rather than the space itself. It could include theatre spotlights, projection equipment, lighting in TV and photographic studios, medical lighting in operating theatres and doctors' and dentists' surgeries, illuminated signs, coloured or stroboscopic lighting and art objects with integral lighting such as sculptures, decorative fountains, and chandeliers.

Use of England & Wales documents

1.10 Where the *Non-Domestic Building Services Compliance Guide* and the *National Calculation Methodology (NCM) modelling guide (for buildings other than dwellings in England and Wales)*, refers to Part L (Conservation of fuel and power) of the building regulations for England & Wales and associated Approved Documents L2A and L2B, it should be read as referring to the corresponding references in Part F (Conservation of fuel and power) of the Building Regulations (Northern Ireland) 2012 and this Technical Booklet.

Fixed building service systems

System efficiencies

2.64 Every fixed building service should be at least as efficient as the minimum acceptable efficiency for that particular type of appliance or fitting given in the *Non-Domestic Building Services Compliance Guide*.

The efficiency claimed for the fixed building service should be based on the appropriate test standard given in this guide and the test data should be certified by a notified body.

Where a particular technology is not covered by this guide, it should be demonstrated that the proposed technology has a performance that is equivalent to a reference system of the same type whose details are given in this guide.

Controls

2.65 The following provisions should be made for heating, ventilation, and air conditioning system controls –

(a) the fixed building services system(s) should be subdivided into separate control zones to correspond to each area of the building that has a significantly different solar exposure, or occupancy period or type of use.

(b) each separate control zone should be capable of independent timing and temperature control and, where appropriate, ventilation and air circulation rate.

(c) the service should respond to the requirements of the space it serves. Where both heating and cooling are provided, they should be controlled so as not to operate simultaneously, and

(d) central plant should operate only as and when the zone systems require it. The default condition should be "off".

CONTROLLED SERVICES

General

3.40 Where the work involves the provision, replacement, or extension of a fixed building service the service should be provided and installed in accordance with the provisions and standards given in the *Non-Domestic Building Services Compliance Guide*. This guide covers the following services –

(d) fixed internal lighting.

3.42 The efficiency claimed for the fixed building service should be based on the appropriate test standard as given in the *Non-Domestic Building Services Compliance Guide* and the test data should be independently certified by an accredited body. Where a particular technology is not covered in this guide, it should be demonstrated that the proposed technology has a performance that is equivalent to a reference system of the same type whose details are given in this guide.

TECHNICAL STATEMENT

FOR LIA MEMBER USE ONLY

CONSEQUENTIAL IMPROVEMENTS

General

3.77 Consequential improvements should be made to an existing building having a total useful floor area greater than 1000 m^2, where any of the following apply –
(a) it is extended.
(b) any fixed building service (other than a renewable energy generator) is installed for the first time, or
(c) an existing fixed building service (other than a renewable energy generator) is increased in capacity.

On extending a building

3.81 Where an existing building having a total useful floor area greater than 1000 m^2 is to be extended, or the habitable area is increased, consequential improvements should be made to the existing building in accordance with paragraph 3.82 and Table 3.5.

3.82 Measures from Table 3.5 should be adopted to the extent that the total cost of the consequential improvements is not less than 10% of the value of the principal works. The value of the principal works and the value of the consequential improvements should be established using prices current at the date of deposit of the plans with the district council and should be confirmed in a report signed by a suitably qualified person.
An example of a suitably qualified person would be a chartered quantity surveyor.

Table 3.5	Consequential improvements that in ordinary circumstances are practical and economically feasible
4	Upgrading general lighting systems that have an average lamp efficacy of less than 40 lamp lumens per circuit watt and that serve areas greater than 100 m^2 by the provision of new luminaires or improved controls

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Non- domestic Building Services Compliance Guide - 2013 Edition

12.4 Lighting in new and existing buildings

a. Lighting in new and existing buildings should meet the recommended minimum standards for:

i. efficacy (averaged over the whole areas of the applicable type of space in the building) and controls in Table 42

OR

ii. the LENI in Table 44. The LENI should be calculated using the procedure described in section 12.5.

b. The lighting should be metered to record its energy consumption in accordance with the minimum standards in Table 43.

c. Lighting controls in new and existing buildings should follow the guidance in BRE Digest 498 *Selecting lighting controls*. Display lighting, where provided, should be controlled on dedicated circuits that can be switched off at times when people will not be inspecting exhibits or merchandise, or being entertained.

Table 42 Recommended minimum lighting efficacy with controls in new and existing buildings

		Initial luminaire lumens/circuit-watt
General lighting in office, industrial and storage spaces		60
Controls	Control factor	Reduced luminaire lumens/circuit-watt
a daylit space with photo-switching with or without override	0.90	54
b daylit space with photo-switching and dimming with or without override	0.85	51
c unoccupied space with auto on and off	0.90	54
d unoccupied space with manual on and auto off	0.85	51
e space not daylit, dimmed for constant illuminance	0.90	54
a + c	0.80	48
a + d	0.75	45
b + c	0.75	45
b + d	0.70	42
e + c	0.80	48
e + d	0.75	45
General lighting in other types of space		The average initial efficacy should be not less than 60 lamp lumens per circuit-watt
Display lighting		The average initial efficacy should be not less than 22 lamp lumens per circuit-watt

Table 43 Recommended minimum standards for metering of general and display lighting in new and existing buildings

	Standard
Metering for general or display lighting	a. kWh meters on dedicated lighting circuits in the electrical distribution; or b. local power meter coupled to or integrated in the lighting controllers of a lighting or building management system; or c. a lighting management system that can calculate the consumed energy and make this information available to a building management system or in an exportable file format. (This could involve logging the hours run and the dimming level, and relating this to the installed load.)

Table 44 Recommended maximum lighting energy consumption (kWh) per sqm per year in new and existing buildings (lighting energy limit)

Hours			Illuminance (lux)								Display Lighting	
Total	Day	Night	50	100	150	200	300	500	750	1000	Normal	Shop window
1000	821	179	1.11	1.92	2.73	3.54	5.17	8.41	12.47	16.52	10.00	
1500	1277	223	1.66	2.87	4.07	5.28	7.70	12.53	18.57	24.62	15.00	
2000	1726	274	2.21	3.81	5.42	7.03	10.24	16.67	24.70	32.73	20.00	
2500	2164	336	2.76	4.76	6.77	8.78	12.79	20.82	30.86	40.89	25.00	
3000	2585	415	3.31	5.72	8.13	10.54	15.37	25.01	37.06	49.12	30.00	
3700	3133	567	4.09	7.08	10.06	13.04	19.01	30.95	45.87	60.78	37.00	
4400	3621	779	4.89	8.46	12.02	15.59	22.73	37.00	54.84	72.68	44.00	96.80
5400	4184	1216	6.05	10.47	14.90	19.33	28.18	45.89	68.03	90.17	54.00	
6400	4547	1853	7.24	12.57	17.89	23.22	33.87	55.16	81.79	108.41	64.00	
8760	4380	4380	10.26	17.89	25.53	33.16	48.43	78.96	117.12	155.29	87.60	192.72