

Technical Handbook - Non-Domestic

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Table of Contents

Technical Handbook: Non-Domestic	1
7. Sustainability	2
7.0 Introduction	2
7.1 Statement of sustainability	6
Annex 7.A Example options of measures for the control of solar gain	20
Annex 7.B Supplementary guidance in the aspect of biodiversity	21
Annex 7.C Daylight factor calculation	22
Annex 7.D Example cycle and scooter parking	23
Annex 7.E Example of a dedicated internal drying area	23
Annex 7.F Supplementary guidance in the aspect of optimising performance	24

Technical Handbook: Non-Domestic

Sustainability

7.0 Introduction

7.0.1 Background

Sustainable development has been defined as meeting “the needs of the present without compromising the ability of future generations to meet their own needs” by the Brundtland Commission of the United Nations in 1983. It follows that the process of sustainable development and the quality of ‘sustainability’ to aspire to within the built environment should account for:

- social, economic and environmental factors
- the potential for long-term maintenance of human well-being in and around buildings
- the well-being of the natural world and the responsible use of natural resources, without destroying the ecological balance of the area where these resources originate or are processed, and
- the ability for the built environment to be maintained.

The Building (Scotland) Act 2003 allows Scottish Ministers to regulate for the purpose of furthering the achievement of sustainable development. In Scotland, sustainability is embedded into the building regulations for all new buildings, rather than reference being made to new buildings achieving levels within a voluntary system. Since 2005, progress has been made by strengthening the standards on, for example, energy efficiency and accessibility for all new buildings so they are comparable with the best in Europe.

Whilst the standards within Sections 1 - 6 of the 2013 Technical Handbooks deliver a level of sustainability in a number of areas such as energy and surface water drainage, there is always the possibility of going beyond the minimum standard. Scottish Ministers consider that it is not practicable at this time to require every building to incorporate higher performance standards or further sustainability measures. However, developers may wish to gain recognition for building to higher standards. Additionally, organisations such as planning authorities or funding bodies may choose to make constructing to a higher level of sustainability a condition of approval or funding.

Defining higher standards to measure sustainability will enable higher quality buildings to be created and for such benefits to be formally recognised. The continued development of Section 7 is the next step in encouraging the sustainable design and construction of all new buildings within a broader context of sustainable development. Further reductions in carbon dioxide (CO₂) emissions from new buildings will also assist in meeting targets within the Climate Change (Scotland) Act 2009.

On 1st of May 2011, Sustainability labelling was introduced to the Scottish Building Standards through the Building (Scotland) Act 2003 which allows Ministers to make building regulations for the purpose of furthering the achievement of sustainable development. Applicable to all new buildings, the principles build upon the degree of sustainability already embedded within the building regulations.

7.0.2 Aims

The aim of the standard in Section 7 is to:

- recognise the level of sustainability already achieved by the building regulations. By setting the 2013 Standards as the benchmark level, credit is given to meeting the standards within Sections 1 - 6 of the building regulations. This will emphasise that

a degree of sustainable design and construction is not a niche market but must be achieved in all new buildings

- encourage more demanding sustainability standards through enhanced upper levels
- encourage consistency between planning authorities that use supplementary guidance to promote higher measures of sustainable construction in their geographical areas. By making reference to this standard, local aspirations can be met by selection of clear national benchmarks. Levels of sustainability have been defined that must include a low or zero carbon generating technology, with reference to Section 72 of the Climate Change (Scotland) Act 2009.

7.0.3 Scope

Measures on sustainability are broadly related to the built form, but some matters that are associated with sustainable development such as location and transport cannot be adequately delivered by the building standards system.

Whilst recognising the complexities and variety of non-domestic building types it is anticipated that Section 7, Sustainability will be extended in future for all non-domestic buildings where criteria is defined and verifiable via the building standards system.

At present only the aspect of carbon dioxide emissions is defined within the non-domestic sustainability standard for all non-domestic buildings, other than schools. Sustainability has been fully developed for school buildings which helps act as a pathfinder for further coverage of non-domestic buildings.

The scope of the measures for schools can be divided into the following sets:

- **Climate change, energy efficiency, and resource use** - will promote the more efficient use of energy, fuel and water in buildings. Encouragement of efficient land use by minimising the impact of building development through enhancing or protecting biodiversity. Reducing water use will reduce the energy consumed and the carbon emissions associated with distributing, processing and heating of water. It is also important that building occupants have the opportunity to understand how their behaviour can reduce use of these resources.
- **Well-being** - buildings should be designed to accommodate flexibility, for users. Aspects of design for improved well-being, such as enhancing natural daylight, addressing acoustics, and providing access to considered outdoor spaces, should be encouraged for all new schools.

There are areas currently considered inappropriate for inclusion in the optional upper levels for new buildings due to the complexity of some subjects related to building design and construction, such as material sourcing and embodied energy. However the Sullivan Report ('A Low Carbon Building Standards Strategy for Scotland'; published by Scottish Ministers in 2007) recommends total-life zero carbon buildings by 2030. This section can respond in due course to the growing relative importance of embodied energy as the performance of new buildings improves further. At present these areas are outside the scope of this standard. References to external examples of guidance that allow appraisal of local or ethical construction material sourcing, embodied energy and use of recycled materials are the BRE's Green Guide to Specification (www.bre.co.uk) and the materials section on www.greenspec.co.uk.

Schools in particular occupy a central place within a community or neighbourhood. Therefore the concept of a 'sustainable school' as a whole will reach out beyond the site boundary and include better and safer active travel routes to and from a school. It is clear that location is outwith the remit of building standards but this part of sustainable design is addressed in Scottish planning policy. The planning document 'Designing Streets' contains guidance that should be applied when the connections between schools and the places they inhabit are being considered and designed.

7.0.4 Explanation of terms

Aspect is a term used for a subject area of sustainability. Due to the coverage of building standards and the position of the warrant process in the overall development process, aspects covering resource use and performance are more prominent in this standard. Examples of aspects named and defined in this standard for school buildings containing classrooms are:

- Water efficiency
- Well-being, and
- Material use and waste

Level is a term used as a banding, where all the aspects of sustainability have reached a certain cut-off point. Upper levels in some aspects, whether defined now or still to be defined, may become absorbed into guidance in Sections 1 - 6 to meet revised mandatory functional standards following future reviews of these sections. However, they should not be seen as predictions because the process for review of these sections are independent of Section 7.

Classrooms is a term used to cover general teaching rooms, and other educational spaces such as sports halls, swimming pools, laboratories, workshops, music studios, drama and dance spaces, art classrooms, digital technology accommodation, atria, break out areas, communal spaces and library spaces.

Ancillary spaces is the term used to cover spaces such as receptions, staff rooms, corridors, administrative offices, medical and facility management rooms, and toilets.

Green roof is the roof of a building that is partially or completely covered with vegetation, planted over a waterproofing membrane.

Living wall is the wall of a building, that is partially or completely covered with vegetation, either growing directly on a wall or, as part of specially designed wall.

7.0.5 Latest changes

The following change has been introduced since October 2013:

- **Standard 7.1** - amendments have been made to guidance with regard to the carbon dioxide (CO₂) emissions target within the Silver and Gold level of Sustainability labelling in relation to the CO₂ emissions target introduced by the 2015 energy standards.

7.0.6 Relevant legislation

The Climate Change (Scotland) Act 2009 introduced clause 3F into the Town and Country Planning (Scotland) Act 1997. This places an obligation on local authorities within their development plans to avoid a specified and rising proportion of greenhouse gases by use of low and zero carbon generating technologies. Some of the levels in this standard could be referred to by local authorities when setting local policy in response to this legislation.

The EU Renewable Energy Directive 2009/28/EC states that by December 2014 Member States shall, in their building regulations and codes or by other means with equivalent effect, where appropriate, require the use of minimum levels of energy from renewable sources in new buildings and in existing buildings that are subject to major renovation.

7.0.7 Retrospective application

Scottish Ministers have powers under Section 25 of the Building (Scotland) Act 2003 to make a Direction to local authorities where they consider that buildings of any description to which building regulations apply, ought to comply with a provision of the regulations.

This power has been used to direct local authorities to apply Section 7 to buildings that have been assessed by verifiers. This would only be relevant for buildings that met Sections 1- 6, that have been in force since October 2010 and where, an applicant seeks the recognition that a specified level of sustainability on a label offers. Directions to local authorities, which enable the following measures, are published on the Building Standards Division website.

7.0.8 Certification

Scottish Ministers can, under Section 7 of the Building (Scotland) Act 2003, approve schemes for the certification of design or construction for compliance with the mandatory functional standards. Such schemes are approved on the basis that the procedures adopted by the scheme will take account of the need to co-ordinate the work of various designers and specialist contractors. Individuals approved to provide certification services under the scheme are assessed to make sure that they have the qualifications, skills and experience to certify compliance for the work covered by the scope of the scheme. Checking procedures adopted by Approved Certifiers will deliver design or installation reliability in accordance with legislation.

7.0.9 Other sustainability indicators

Other tools to assess a level of sustainability for new buildings exist and are used in Scotland. These indicators may be selected as appropriate for some developments because they cover issues such as location, orientation on site, or transport that are broader than building regulations can include. Other established indicators place greater emphasis on the sourcing and embodied energy of construction materials, an area flagged up in this section for future review. Other tools could be complementary in an assessment of sustainability but they cannot be used as a method to meet an optional upper level of sustainability within building regulations.

7.1 Statement of sustainability

Mandatory Standard

Standard 7.1

Every building must be designed and constructed in such a way that:

- a. with regard to a dwelling, or school building containing classrooms, a level of sustainability specified by the Scottish Ministers in respect of carbon dioxide emissions, resource use, building flexibility, adaptability, and occupant well-being is achieved
- b. with regard to a non-domestic building other than a school building containing classrooms, a level of sustainability specified by the Scottish Ministers in respect of carbon dioxide emissions is achieved, and
- c. a statement of the level of sustainability achieved is affixed to the dwelling or non-domestic building.

Limitation:

This standard does not apply to:

- a. alterations and extensions to buildings
- b. conversions of buildings
- c. buildings that are ancillary to a dwelling that are stand-alone having an area less than 50 square metres
- d. buildings which will not be heated or cooled other than by heating provided solely for the purpose of frost protection
- e. buildings intended to have a life not exceeding the period specified in regulation 6, or
- f. conservatories.

7.1.0 Statement of sustainability (sustainability label)

The statement of sustainability (sustainability label, or SL) that includes the level of sustainability achieved must be fixed to the building prior to completion. The sustainability label should be indelibly marked and located in a position that is readily accessible, protected from weather and not easily obscured. A suitable location could be in a plant room or the owner may choose to display the label in a more prominent location. An example of an approved label is given in Annex G. A program to generate such a label that is specific to a building is accessed here: <http://www.s7sust.co.uk/>.

7.1.1 Levels of sustainability for non-domestic buildings

The award of a sustainability label at the baseline level for all non-domestic buildings (including a school building containing classrooms) should be selected from the following defined within clauses 7.1.3 – 7.1.4:

- Bronze or Bronze Active

The award of a sustainability label at the upper levels would depend upon meeting all 8 aspects. Aspects cannot be traded-off to achieve a score, reinforcing the approach that sustainable outcomes rely on holistic integrated design. The following optional upper levels are only available for school buildings containing classrooms as defined within clauses 7.1.5 – 7.1.9:

- Silver or Silver Active
- Gold

However, all non-domestic buildings that exceed the mandatory standard by achieving the defined upper level criteria in the aspect of carbon dioxide emissions defined within clauses 7.1.6 and 7.1.9 are welcomed. For example, a new building could have a sustainability label at Bronze Active level, which also indicates that a Gold level has been achieved in the aspect of carbon dioxide emissions. This achievement would be clearly reflected on the sustainability label.

7.1.2 Upper levels of sustainability for school buildings

Optional upper levels of sustainability for a school building containing classrooms should be selected from the following, defined within clauses 7.1.4 - 7.1.9:

- Silver or Silver Active
- Gold

The aim is for balance in the setting of upper levels because sustainability is considered in the round rather than focusing on issues of energy or carbon emissions. Reaching upper levels should be a valid target for any new development, regardless of size or location. Generally, levels have been set to avoid individual aspects that could upset applications which might otherwise meet all of the other aspects of sustainability.

The first optional upper level 'Silver' offers substantial benefits in a range of sustainability aspects which should be achievable by most new schools. The second optional upper level 'Gold' is a more demanding target, initially aimed at those intent on pursuing best practice.

School buildings that exceed a Gold sustainability level are also welcomed. A third upper level called 'Platinum' has been reserved for further recognition within the building standards system. At present, only the aspect of carbon dioxide emissions has been defined for this level.

School buildings that exceed Bronze, Bronze Active, Silver, Silver Active or Gold levels by achieving a higher level criteria in one or more of the aspects are welcome and reflected on the sustainability label. However, the achievement of the next upper level (Platinum) will only be recognised once all aspects of that particular level have been included. The award of an overall upper level depends upon meeting all aspects rather than allowing trade-offs to achieve a score, reinforcing the fact that sustainable outcomes rely on holistic integrated design.

The specified levels of sustainability in clauses 7.1.3 to 7.1.9 are sets of measures that are transparent to all including verifiers, planners, funding bodies, and building users.

7.1.3 Bronze level

This is the baseline level for sustainability achieved where a non-domestic building, (including a school building containing classrooms) meets the functional standards set out in Sections 1 – 6 of this Handbook.

7.1.4 Bronze Active level

This is the baseline level where a non-domestic building (including a school building containing classrooms) meets the functional standards set out in Sections 1 – 6 of this Handbook, but in addition the non-domestic building includes the use of a low and zero carbon generating technology (LZCGT) in respect of meeting Standard 6.1 within Section 6, Energy. This level is primarily to assist local authorities to meet their obligations under Section 72 of the Climate Change (Scotland) Act 2009 by identifying the use of LZCGT. In this respect, LZCGTs include: wind turbines, water turbines, heat pumps (all varieties), solar thermal panels, photovoltaic panels, combined heat and power units (fired by low emission sources), fuel cells, biomass boilers/stoves and biogas.

7.1.5 Silver level for school buildings containing classrooms

A school building at this first optional upper level should meet all the standards in Sections 1 – 6 that apply to the building for the Bronze level and, in addition, the school building should comply with the Silver level in each of the eight aspects below.

7.1.6 Carbon dioxide emissions only at Silver level for all other non-domestic buildings

All non-domestic buildings at this first optional upper level (in this aspect only) should meet all the standards in Sections 1 – 6 that apply to the building for the Bronze level and in addition, the building should comply with the following aspect:

Aspect Silver level 1: Carbon dioxide emissions

All new non-domestic buildings that meet or exceed the Target Emissions Rate (TER) detailed in Section 6, Energy of this Handbook, will automatically meet the Silver level criteria in respect of CO₂ emissions. This is due to the 43% improvement on the 2010 Standards that occurred in October 2015.

Aspect Silver level 2: Energy for thermal comfort and artificial lighting - This aspect only applies to school buildings containing classrooms.

Sustainability in the first instance should encourage natural means for heating, cooling, and ventilating a building. However it is recognised that it is not always possible to achieve this for all new buildings, there will always be the need for some form of artificial lighting, heating systems and mechanical ventilation.

a. **artificial lighting control:** good levels of natural daylight is encouraged in the well-being aspect, therefore artificial lighting control is addressed as part of the energy aspect. All fixed artificial lighting for:

- classrooms to be automatically controlled using presence or absence detection sensors, with daylight photoelectric switching or dimming devices

- ancillary spaces to be automatically controlled using presence or absence detection switching or dimming devices
- classrooms and ancillary spaces to have a time operated switch to allow lighting to be automatically turned off when the school is not in operation.

It is not necessary for this to apply to either emergency lighting or specialist process lighting. An example of specialist process lighting is stage spotlights.

Automatically controlled presence or absence detection should not be used where this may cause a hazard or inconvenience (e.g. in an accessible toilet, changing places toilet or medical room).

b. **thermal comfort control:** in Scotland, the heating season is potentially long, often 8-9 months of the year and therefore heating provision within a building is a key consideration. Schools designed and constructed to meet Section 6, Energy will have a thermally efficient external envelope and benefit from intuitive controls. For all fixed services that use energy for the purpose of providing thermal comfort should have:

- optimised stop start
- a dead band thermostat* installed in every teaching space
- direct acting weather compensation system
- heat recovery where mechanical ventilation is used.

*A dead band thermostat has a function where no conditioning occurs between a specific temperature range, proposals include energy required for fans.

c. **effective control of solar gain:** to minimise the potential for summertime overheating all roof lights and south facing window openings should include measures for the effective control of solar gain. Example options are provided in Annex A.

This does not apply to areas of glazing that form part of an unheated room or space.

Aspect Silver level 3: Water Efficiency - This aspect only applies to school buildings containing classrooms.

a. **water use efficiency:** for the most part, Scotland does not suffer from water shortages. However, a significant proportion of energy is used for the abstraction and disposal of water as well as the heating of water for health and hygiene within a school. Therefore addressing water use efficiency is to reduce the energy used throughout the water cycle. Enhanced or additional fittings should be provided as follows:

- WCs of average flush volume not more than 4.5 litres and fitted with a delayed-action inlet valve
- wash hand basin taps with a flow rate not more than 6 l/min; fitted with either a timed automatic shut-off or an electronic detection sensor; (an automatic shut off or electronic detection sensor does not have to be provided in an accessible or changing places toilet)
- shower heads with a maximum flow rate not more than 8 l/min fitted with a timed automatic shut-off (an automatic shut off or does not have to be provided to a shower within an accessible or changing places toilet), and
- water storage container(s) (with a combined minimum capacity of 200 litres) with an overflow discharging to a SUD system, a soakaway, or an outfall to a watercourse.

A delayed-action inlet valve for siphon flush toilets saves water by preventing the cistern refilling until the flush cycle is completed.

When specifying water efficient fittings consideration should be given to the operational flow rates that some heating or hot water appliances, such as combination boilers, or point of use or instantaneous water needs to activate their water heating function.

When installing low volume flush WCs, the pipe diameter and gradient inter-relationship is critical in order that the new and any existing sections of the drain are self-cleansing.

b. **energy for water heating:** at least 10% of the annual energy demand for water heating required should be from heat recovery and/or renewable sources with little or no associated fuel costs (e.g. solar thermal water heating and associated storage).

In areas where a large amount of energy is required for hot water the generating equipment and storage vessels should be situated as near as conveniently possible to where the majority of hot water is used.

A school building is recognised as having a dispersed and occasional hot water use. So to prevent high standing losses for Domestic Hot Water (DHW) localised equipment should be used.

Point of use/instantaneous electrically heated water is a system where the water is supplied to the draw off points from a device, in which water is heated by an electric element(s), and should be considered where the use of hot water is remote from the main hot water heating systems.

Where a system cannot achieve an efficiency of 50% then point of use or instantaneous hot water systems should be used.

Point of use electrically heated water system should comply with BS EN 60335-2-21. Instantaneous electrically heated water system should comply with BS EN 60335-2-35: 2003.

c. **surface water management:** the design and construction of school roofs, and hard surfaces should include one or more of the following Sustainable Urban Drainage (SUD) measures capable of controlling 50% capacity of the predicted rainfall for the overall site and also enhance the biodiversity value of the site:

- attenuation ponds
- swales
- rainwater harvesting for the flushing of WCs
- permeable surfaces to enable total infiltration of surface water to the underlying ground. Where existing soil types do not permit total infiltration the paved surface may direct surface water to a soakaway, swale, attenuation pond or natural water course
- a green roof or living wall.

Designers may have to undertake a risk assessment to manage or alleviate any health and safety concerns that may arise from the inclusion of a SUD measure.

Where surface water drainage is included as part of an existing community SUDS, the building can utilise an existing system where capacity is available.

Areas of green roofs, living walls and attenuation ponds included as part of the source control SUDS option may be included as part of the calculation for the overall area dedicated for natural habitat outlined in Aspect 4 Biodiversity.

Aspect Silver level 4: Biodiversity - This aspect only applies to school buildings containing classrooms.

Biodiversity is highly valued in the school estate. The reasons for inclusion is to minimise the impact of a building development on an existing site, to enhance biodiversity and encourage natural habitats on developments as well as increasing the opportunity for pupils to have greater contact with nature.

- a. **allotment:** provision of a dedicated area set aside for use as an allotment with an area of at least 5% of the building footprint. The allotment area should contain the following:
 - 2 composting containers with a combined minimum capacity of not less than 160 litre
 - water storage container(s) (with a combined minimum capacity of 200 litres) with an overflow discharging to a SUD system, a soakaway, or an outfall to a watercourse (this can be included as part of the water efficiency measure in Aspect 3 Water Efficiency)
 - dedicated space for a green house with a minimum area of 6m²
 - covered enclosure with a minimum area of 6m² giving protection from inclement weather for the secure storage of maintenance equipment should also be provided.
- b. **natural boundary:** 25% length of the site boundary that does not form part of the building elevation to be defined/augmented by planting or natural features (natural features can include attenuation ponds, woodland, natural habitats and allotments).
- c. **natural habitat or native woodland area:** provision of a dedicated area of approximately 15% of the overall site area capable of evolving into a designated:
 - natural habitat area, used to support native floral and fauna species, or
 - native woodland area used for species known to attract or benefit local wildlife.
- d. **biodiversity strategy document:** provision of an ecological report and a bespoke user guide for the school, for use by pupils, teachers and the wider community related to enhancing biodiversity and developing ecological understanding, prepared by a person with appropriate training, knowledge, experience and skill.

An example of bespoke biodiversity user guide and a guidance template to prepare the user guide can be found in Annex B.

Aspect Silver level 5: Well-being - This aspect only applies to school buildings containing classrooms.

- a. **natural daylight:** research has shown that good natural daylight is beneficial to a sense of well-being and has the potential to improve academic performance. Schools are primarily occupied during daylight hours and therefore natural daylighting should be the prime means of lighting a school where available. Good levels of natural daylight also reduces the need for artificial lighting. A minimum average daylight factor (DF) of 3% should be achieved in all classrooms at a working plane.

The reference point for the working plane should be between 500 - 900mm from floor level.

For 75% of classrooms where natural daylight is provided, a uniformity ratio should be achieved in the range of:

- 0.3 to 0.4 for vertical areas (e.g. windows)
- 0.6 to 0.8 for horizontal areas (e.g. roof lights)

A simplified DF calculation can be found in Annex C.

The guidance given here is written in terms of applying a simplified calculation. However other calculation tools or techniques may be used (such as daylight calculations used in dynamic simulation modelling or Computer Aided Drawing (CAD) software) provided they are based on one of the following methodologies:

- CIBSE Guide A: Environmental Design
- BS EN 8026-2: 2008
- BRE Digest 309

The benefits of providing natural daylighting generally outweigh the drawbacks. However, there are recognised issues that should be considered when balancing the requirements:

- glare particularly from low level winter sun
- excessive heat gains during summer months
- safe methods of cleaning glass
- maximising natural light while meeting the challenging energy standards where a larger glazed area is used.

b. **indoor air quality monitor:** good indoor air quality (IAQ) is an important issue for sustainable school design. Ventilation to maintain IAQ contributes to the health, comfort and well-being of the occupants. Although the occupancy levels of a classroom vary throughout the day, the measuring and monitoring of classrooms will make sure that optimum IAQ is maintained whilst maximising the efficiency of a mechanical ventilation system, where it is used.

All teaching classrooms to have a real-time display monitor that measures the CO₂ parts per million (ppm) levels, and temperature (deg C) to alert room occupants when the average concentration of CO₂ reaches 1500 ppm when measured at 1500mm above floor level.

c. **acoustics:** background noise can be a significant obstacle to effective listening. Favourable classroom acoustics benefit pupils and teachers alike improving pupils' well-being and educational performance as well as enhance a school's suitability for alternative uses.

A written design specification, provided by a specialist acoustic consultant to determine appropriate acoustic performance levels for all classrooms which address the following:

- indoor ambient noise levels including noise from building services
- airborne sound insulation between teaching/activity spaces
- airborne sound insulation between circulation spaces and other occupied spaces
- impact sound insulation of floors
- reverberation in teaching and study spaces
- sound absorption in corridors, entrance halls and stairwells
- design of open plan areas (where applicable).

The specialist acoustic report should be prepared by a person with appropriate training, knowledge, experience and skill of school design.

- d. **room height:** to assist designers in meeting the specified natural daylight factors and reduce the likelihood of a classroom having increased CO₂ concentrations levels, 80% of all classroom areas should achieve an average minimum floor to ceiling height of 3500mm for secondary schools and 3000mm for a primary school.

Aspect Silver level 6: Flexibility and Adaptability - This aspect only applies to school buildings containing classrooms.

Active travel is an approach to travel and transport that focuses on physical activity walking and cycling. The purpose of the guidance is aimed at accommodating staff, pupils and visitors that walk or cycle to school or participate in outdoor activities, by including facilities such as cycle storage, changing facilities, transition spaces, lockers and dedicated drying spaces.

a. **cycle storage**

Table 7.1 Storage Ratio

Primary School	Secondary Schools
1 space per 20 staff	1 space per 20 staff
1 space per 20 pupils	1 space per 10 pupils

Key cycle storage provisions:

- all schools to provide a minimum of 2 spaces for visitors not more than 50m from the principal entrance
- 50% of overall capacity to provide shelter overhead from inclement weather
- 50% of overall capacity to be within 100m of the principal entrance of the school building in an area of visual surveillance, protected from vehicular traffic, and which does not cause an obstruction to pedestrian flow
- all bicycle stands should be securely fixed to a hard surface or a permanent vertical surface
- for primary schools up to 50% of the cycle storage spaces can be replaced by a non motorised scooter parking facility.

An example of cycle and scooter parking can be found in Annex D.

Accommodating active travel and in particular commuting by cycle may not be appropriate for all schools. (i.e. rural locations where the population is dispersed and routes to the school are not suitable for walking or cycling. Where cycling to school does not form part of an Active Travel Plan a minimum of 2 spaces for visitors not more than 50m from the principal entrance should still be provided.

- b. **staff active travel facilities:** to support active travel and encourage outdoor activity in all weather conditions the following facilities should be provided on a ratio of 1 per 10 cycle storage spaces, or part thereof; and include:

- shower
- seating adjacent to the shower with a minimum dimension of 600mm wide x 400mm deep
- 2 clothes hooks
- a secure locker, with a minimum size of 300mm wide, 600mm deep 1200mm high to accommodate outdoor clothing and equipment

- a dedicated drying space, with a minimum linear hanging length of 7.2m.

Where reasonably practicable drying spaces should be designed to be passively heated and ventilated.

A dedicated drying space designed to be passively heated should have glazed openings located on one or more of the south, east, or west facing elevations. A dedicated drying space should be designed to be naturally ventilated.

Where the dedicated drying space is not passively heated a heat source should be provided that is independent from the primary heating system and capable of maintaining a temperature of 18⁰C when the outside temperature is -1⁰C and controlled by a time switch.

Where the dedicated drying space is not naturally ventilated, a mechanical extract vent should be provided and have an intermittent capacity of at least 30 l/s (a humidistat at 50-60% relative humidity) or Mechanical Ventilation Heat Recovery (MVHR) controlled on a time switch.

It is recommended that internal linings of a dedicated drying space should be of a suitably hygroscopic (moisture absorbing) material.

Where the drying space is not incorporated within the room with the active travel facilities then access should be directly from the active travel facilities.

Examples of a dedicated drying area are shown in Annex E.

Active travel facilities can be included as part of a greater quota for the overall school (i.e. where sports changing facilities are present within a school). However where changing and showering facilities are located in a separate building contained within the same campus, there should be at least one space provision for changing and showering within each new building.

- c. **pupil active travel facilities:** 1 secure active travel locker per pupil, with a minimum size of 300mm wide, 450mm deep 1200mm high to accommodate active travel equipment i.e. shoes, clothing, helmet, backpack. For primary school pupils the height of the locker can be reduced to not less than 600mm.
- d. **vehicle parking and drop off areas:** 'shared space' is a design approach that seeks to change the way streets operate. The principle is aimed at prioritising pedestrians and cyclist movement and reducing the dominance of motor vehicles by removing the traditional regulatory functions and formal demarcation, such as signposting, and kerbing.

Where parking facilities, setting down points and turning circles are provided, these spaces should be designed and constructed to be a level surface with the removal of all kerbs and barriers between footpaths and roads, to encourage shared spaces principles.

Further information on shared space can be found at: Local transport note – shared space www.gov.uk/government/uploads/system/uploads/attachment_data/file/3873/ltn-1-11.pdf.

- e. **external teaching space:** provide an external structure giving overhead protection from inclement weather with an area not less than 35m² for primary schools and 45m² for secondary schools for the purpose of facilitating general teaching activities, external performances or outdoor play.

Aspect Silver level 7: Material use and Waste - This aspect only applies to school buildings containing classrooms.

The collection and sorting of solid waste for recycling is an activity that building users can contribute towards. This should include metal, glass, cardboard and paper, plastic and

printer/toner cartridges, as well as food and horticulture waste suitable for composting or collection from a bio digestion facility. It helps balance the technical design focus of many of the other aspects because it is part of an adaptive solution to a sustainable future.

- a. **recycling of solid waste:** a strategy document to be provided as part of the user guide in Aspect 8 which identifies dedicated spaces for the collection and storage of everyday recyclable materials.

A dedicated external storage space to be provided which caters for recyclable materials (including excess food waste that is not composted on site), generated by users of the building during occupation.

The space allocated should have a washable hard surface area to accommodate waste containers required by the waste collection authority. Convenient access to the contents of the container should be provided to allow removal.

The hard surface may be a collection point designated by the waste collection authority where the container can be removed or emptied. If the hard surface is not the collection point then there should be an accessible route along which the container can be transported to the collection point.

The storage area should have provision for washing down and draining into a wastewater drainage system. Gullies should incorporate a trap that maintains a seal even during periods of disuse. Walls and floors should be of an impervious surface that can be washed down easily and hygienically.

Any enclosure for the storage of waste should be designed as to prevent access by vermin unless the waste is to be stored in secure containers with close fitting lids, such as wheeled bins.

Aspect Silver level 8: Optimising Performance - This aspect only applies to school buildings containing classrooms.

- a. **user information guide:** provide guidance for use by the building occupants on the ways in which all classrooms are intended to function (heating cooling, lighting and ventilation) and how to optimise energy performance. This is additional to the written information to be provided for occupants under Section 6 of the Technical Handbooks.

A summary of information to be affixed at the entrance of each classroom to provide guidance to the building user on the ways in which the specific classroom is intended to function (heating, cooling, lighting and ventilation) and how users can optimise the performance.

Information on the scope, format and contents of the guide for occupants can be found in Annex F.

- b. **resource use displays:** install a real-time resource use monitor(s) with the data linked to a visual display located in an easily accessible and readable position at the principal entrance area to the building. For the purpose of teaching, monitoring and recording purposes by pupils staff and the local community that displays energy use for heating, ventilation, cooling, lighting and small power.

7.1.7 Silver Active level

This is the same as the Silver level aspect but, in addition the school includes the use of a low and zero carbon generating technology (LZCGT) in respect of meeting at least one of the aspects: Silver 1, Silver 2 or Silver 3. This level is primarily to assist local authorities to meet their obligations under Section 72 of the Climate Change (Scotland) Act 2009 by identifying the use of LZCGT. In this respect, LZCGTs include: wind turbines, water turbines, heat pumps (all varieties), solar thermal panels, photovoltaic panels, combined

heat and power units (fired by low emission sources), fuel cells, biomass boilers/stoves and biogas.

7.1.8 Gold level for school buildings containing classrooms

A school building at this second optional upper level should meet all the standards in Sections 1 – 6 that apply to the building for the Bronze level and in addition the school should comply with the Gold level in each of the eight aspects below.

7.1.9 Carbon dioxide emissions only at Gold level for all other non-domestic buildings

All non-domestic buildings at this first optional upper level (in this aspect only) should meet all the standards in Sections 1 – 6 that apply to the building for the Bronze level and in addition, the building should comply with the following aspects:

Aspect Gold level 1: Carbon dioxide emissions - This aspect applies to all non-domestic buildings.

Under the guidance to Standard 6.1, carbon dioxide emissions (Building Emission Rate) is to be 38% lower than the Target Emission Rate (TER) set by the 2015 Standards.

To establish this, the TER from the NCM calculation should be multiplied by 0.62, to give a revised figure that the BER should not exceed. (This is equivalent to a 64.3% improvement on the 2010 Standards and a 75% improvement on the 2007 Standards).

Aspect Gold level 2: Energy for thermal comfort and artificial lighting - This aspect only applies to school buildings containing classrooms.

- a. **artificial lighting control:** provide as for Aspect Silver 2
- b. **thermal comfort control:** provide as for Aspect Silver 2, including destratification fans in all spaces with a ceiling height greater than 6m
- c. **effective control of solar gain:** provide as for Aspect Silver 2, including all east, and west facing windows
- d. **building management system** (including sequential control, zone control, weather compensation, frost protection, night set back including monitoring and targeting)
- e. **draught lobby:** should be provided to the main entrance of the school building.

A draught lobby is an arrangement of two doors to the principal entrance or exit of a building that reduces unwanted air infiltration. The enclosed space should open into a public circulation area and the door arrangement should be such that a person with a pushchair or similar item is able to close the outer door before opening the inner door. It may be heated or unheated and may provide access to a cloakroom, store or WC.

Aspect Gold level 3: Water Efficiency - This aspect only applies to school buildings containing classrooms.

- a. **Enhanced or additional fittings should be provided as follows:**
 - WCs of average flush volume not more than 3.5 litres and fitted with a delayed-action inlet valve
 - wash hand basin taps with flow rates to be not more than 4 l/min fitted with either a timed automatic shut-off or an electronic detection sensor (an automatic shut off or

electronic detection sensor does not have to be provided in an accessible or changing places toilet (CPT))

- shower heads with maximum flow rate not more than 6 l/m with a timed automatic shut-off (an automatic shut off or does not have to be provided to a shower within an accessible or CPT)
- water storage container(s) (with a combined minimum capacity of 200 litres) with an overflow discharging to a SUD system, a soakaway, or an outfall to a watercourse, and
- rainwater harvesting or greywater recycling system designed to provide water for toilet flushing.

A delayed-action inlet valve for siphon flush toilets, saves water by preventing the cistern refilling until the flush cycle is completed.

Where point of use or instantaneous water heating is installed consideration should be given to the flow rates that hot water systems need to activate their water heating function when specifying taps and shower heads with lower flow rates.

When installing low volume flush WCs, the pipe diameter and gradient inter-relationship is critical in order that the new and any existing sections of the drain are self-cleansing.

- b. **energy for water heating:** provide as for Aspect Silver 3, except 50% of the annual energy demand for water heating required should be from heat recovery and/or renewable sources with little or no associated fuel costs (e.g. solar thermal water heating and associated storage).
- c. **surface water management:** provide as for Aspect Silver 3 except the design and construction of the school roofs, and hard surface should be capable of controlling 100% capacity of the predicted rainfall for the overall site from one or more of the Sustainable Urban Drainage measures described in Aspect Silver 3.

Areas of green roof, living walls and attenuation ponds included as part of the source control SUDS options may be included as part of the calculation for the overall area dedicated for natural habitat outlined in Aspect 4 of Biodiversity.

Aspect Gold level 4: Biodiversity - This aspect only applies to school buildings containing classrooms.

- a. **allotment:** provide as for Aspect Silver 4.
- b. **natural boundary:** provide as for Aspect Silver 4, except 50% length of the site boundary that is not part of the building elevation to be defined/augmented by planting or natural features (natural features can include attenuation ponds, woodland, natural habitats and allotments).
- c. **natural habitat or native woodland area:** provide as for Aspect Silver 4, except 30% of the overall site area capable of evolving into a designated:
 - natural habitat area, used to support native floral and fauna species, or
 - native woodland area used for species known to attract or benefit local wildlife.
- d. **biodiversity strategy document:** provide as for Aspect Silver 4.

Aspect Gold level 5: Well-being - This aspect only applies to school buildings containing classrooms.

- a. **natural daylight:** provide as per Aspect Silver 5, except an average daylight factor (DF) of 4% should be achieved in all classrooms at a working plane.

- b. **indoor air quality monitor:** provide as for Aspect Silver 5 and, where a room uses mechanical ventilation as the prime means of ventilating the room, this should be linked to automatic controls to make sure the average concentration of CO₂ does not exceed 1500 ppm when measured at 1500mm above floor level.
- c. **acoustics:** a written report and design specification provided by an acoustic consultant that meets the performance standards in Building Bulletin 93: Acoustic design in schools (BB93) for all classrooms. The specialist acoustic report should be prepared by a person with relevant expertise in acoustics for school design.

To assist in making certain that acoustic performance standards are met, acoustic testing of indoor ambient, airborne, and impact noise levels should be undertaken in at least one room in every four of each type of classroom. This should include rooms on the noisiest elevation; measurements should be taken vertically and horizontally between adjacent classrooms.

These classrooms should be finished and unoccupied. It is not intended that measurements should be taken between circulation spaces, entrance halls and stairwells. Measurements should be made when external noise levels are representative of conditions during normal school operation.

Where there is a failure to meet the performance standards in any of the classrooms an additional classroom should be identified and tested. Should the additionally tested classrooms also fail then all of the remaining classrooms must be tested and remedial treatment carried out.

Acoustic testing should be carried out by persons who can demonstrate relevant, recognised expertise in acoustics for sound insulation testing of buildings and carried out in accordance with the methods described in 'The Good Practice Guide' for the acoustic testing of schools published by the Association of Noise Consultants.

- d. **room height:** provide as for Aspect Silver 5.

Aspect Gold level 6: Flexibility and Adaptability - This aspect only applies to school buildings containing classrooms.

- a. **cycle storage**

Table 7.2 Storage Ratio

Primary schools	Secondary schools
1 space per 10 staff	1 space per 10 staff
1 space per 10 pupils	1 space per 5 pupils

Key cycle storage provisions: provide as for Aspect Silver 6

- b. **staff facilities for active travel:** provide as for Aspect Silver 6
- c. **pupil facilities for active travel:** provide as for Aspect Silver 6
- d. **vehicle parking and drop off:** provide as for Aspect Silver 6
- e. **external teaching space:** provide as for Aspect Silver 6 including the following:
 - 1 additional external teaching space should be provided for every 250 pupils or part thereof
 - for schools with a designed overall capacity more than 1000 pupils, provision can be reduced to 1 structure per additional 400 pupils for the necessary capacity over 1000

- 1 fixed external seat per 10 pupils - seat height for children to conform to BS EN 1729, School Furniture UK.
- f. **accessibility:** the principal accessible entrance doors to the building should be provided with an automatic powered opening and closing device as detailed in Section 4, Safety (clauses 4.1.7 and 4.18).
- g. **Changing Places Toilet (CPT):** a CPT is a toilet with a changing facility that is suitable for use by people that have profound and multiple learning disabilities or other disabilities and for whom standard accessible toilets may not be fit for purpose and should be provided for all Secondary Schools which have all of the following facilities:
 - Library
 - Swimming Pool
 - Sports Hall
 - Community meeting rooms.

A typical CPT installation should include the following key elements:

- adequate space (12m²) to allow a user to be assisted by carers
- a minimum ceiling height of 2.4m
- a wall or ceiling mounted tracking hoist
- a centrally placed WC with space either side for the carers
- a height adjustable wash hand basin
- a non-slip floor finish
- a door with a minimum clear opening width of 1m.

In addition to the building related elements, a fully equipped CPT relies on the installation of additional equipment and specialist fittings, such as a height adjustable adult sized changing bench (min 1.8m in length). Further information, including a full specification, can be found at the website of the Changing Places Consortium and BS 8300: 2009.

To be registered on the Changing Places' national register all new CPTs need to meet the standards specified by the Changing Places Consortium (CPC).

Aspect Gold level 7: Material Use and Waste - This aspect only applies to school buildings containing classrooms.

- a. **recycling of solid waste:** provide as for Aspect Silver 7.
- b. **construction site waste management plan:** by consideration of waste minimisation arising from the built-form, the following information should be recorded:
 - construction waste generated on-site
 - procedures to sort, reuse and recycled on-site construction waste.

The quantity of construction waste produced from excavations does not have to be recorded as this is site dependant. However best practice recommends that where possible excavation material should be diverted from landfill.

Likewise it is not possible to reduce demolition waste as this is also dependant on existing site circumstances. It may however be possible to reuse demolition materials in a bid to reduce the amount of new materials required.

Aspect Gold level 8: Optimising Performance - This aspect only applies to school buildings containing classrooms.

- a. **User Guide:** provided as for Aspect Silver 7.
- b. **Resource use displays:** provided as for Aspect Silver 7, including the capability for the information provided from the resource use display to have the data collected and recorded centrally to allow for comparison over a period of time.

7.1.10 Carbon dioxide emissions only at Platinum level for all other non-domestic buildings

All non-domestic buildings at this third optional upper level (in this aspect only) should meet all the standards in Sections 1 – 6 that apply to the building for the Bronze level, and in addition the building should comply with the following aspect:

Aspect Platinum level 1: Carbon dioxide emissions - This aspect only applies to all non-domestic buildings.

Under the guidance to Standard 6.1, the carbon dioxide emissions (Building Emission Rate) is to be 100% lower than the Target Emission Rate set by the 2010 Standards. To establish this, the BER from the NCM calculation should not exceed zero (this net zero carbon equivalent is a 100% improvement on the 2007 Standards).

Aspect Platinum level 2: Energy for thermal comfort and artificial lighting

Not currently defined.

Aspect Platinum level 3: Water Efficiency

Not currently defined.

Aspect Platinum level 4: Biodiversity

Not currently defined.

Aspect Platinum level 5: Well-being

Not currently defined.

Aspect Platinum level 6: Flexibility and Adaptability

Not currently defined.

Aspect Platinum level 7: Material Use and Waste

Not currently defined.

Aspect Platinum level 8: Optimising Performance

Not currently defined.

Annex 7.A Example options of measures for the control of solar gain

Solar shading should be designed to reduce summer time overheating and allow passive solar gain during winter months. Effective solar shading design should not reduce natural lighting within a room to the extent that artificial lighting is required. External shading devices are the most effective as they deflect solar radiation before it enters the building.

Horizontal devices on south facades provide the most effective shading without compromising natural daylight, however this type of measure is not suitable for east and west facades as the angle of the sun is too low. Vertical fins and adjustable devices such as sliding and rotating shutters are best suited to east and west facades. For optimum indoor thermal comfort designers should consider combining effective solar shading with night time cooling through the use of inward opening hopper windows or vents.

Figure 7.1 Horizontal overhangs Horizontal overhang or window reveals are best suited for south facing openings, the total shading depth should be around 50% of the window height and extend no greater than 1500mm for optimum effectiveness. Measures can provide up to 75% solar gain reduction.

Figure 7.2 Horizontal louvres Horizontal louvres and shutters (sliding or rotating) combined with a horizontal overhang can be used on south facades. Measures can provide up to 90-95% solar gain reduction.

Figure 7.3 Shutters Shutters (sliding or rotating) can be used on south, east and west facing facades. Lockable shutters allow secure night time cooling and inward opening windows.

Figure 7.4 Vertical fins Vertical fins (adjustable or fixed) combine with a horizontal overhang are best suited for east and west facades. Measures can provide up to 85-90% solar gain reduction.

Figure 7.5 Awnings Awnings or roller shades can be used on south, east and west facades. Measures can provide up to 60-75% solar gain reduction.

External shading devices should be considered in the first instance. However where external shading devices cannot form part of the external fabric for reasons such as a planning restrictions, internal shading devices such as curtains and blinds can be used. These measures are generally not as effective as external shading devices as they absorb part of the solar radiation within the room or space.

Annex 7.B Supplementary guidance in the aspect of biodiversity

New developments are not always required to undertake a formal ecological assessment as part of a planning application as the condition/state of the existing site is largely predetermined. However almost all sites will have the potential to enhance their ecological value in some form.

It is proposed that the verification of the biodiversity aspect be carried out in two stages. At building warrant application an appropriately qualified person visits the site and prepares an ecological report on the existing key biodiversity characteristics of the site including:

- ecological overview of the site

- baseline habitat
- plant and animal species to note
- surface water features.

The purpose of the report is not to award the site with an ecological value, but to understand the baseline characteristics of the site and have recommendations that could be included and developed in a bespoke biodiversity strategy guide. The information should also inform the most appropriate locations for:

- allotment
- natural boundary
- natural habitat or woodland area required to meet the biodiversity aspect.

This report should then inform a bespoke biodiversity user guide specific for each school geared towards enhancing biodiversity and promoting ecology, recommendations may include:

- maintenance and development of key areas
- the planting of native species or those with a known attraction or benefit to local wildlife
- the adoption of horticultural good practice (e.g. no, or low use of residual pesticides)
- development of a maintenance plan including avoiding clearance/works at key times of the year (e.g. breeding seasons)
- the proper integration, design and maintenance of SUDS and green roofs, where applicable etc.

A good practice template for preparing a biodiversity guide for new schools and an example bespoke biodiversity guide can be found on the Scottish Government website at <http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/techbooks>.

At the completion stage the applicant should re-submit the bespoke biodiversity guide after review and updating of specified items as necessary.

Annex 7.C Daylight factor calculation

$$\text{Average DF\%} = (52 \times M \times W) / A$$

Where:

A = The sum of the area of all room surfaces (ceiling, floor, walls, doors, windows and roof lights), in m²

M = Correction factor for dirt or ease of cleaning, consisting of:

- 1.0 for vertical glazing, or
- 0.8 for sloping glazing, or
- 0.7 for horizontal glazing

W = Glazed area of windows or roof lights, taking account of framing, in m². Measure glazed panes or measure window area including frames then multiply by:

- 0.9 for metal frames (patent glazing), or

- 0.8 for metal frames (large pane), or
- 0.7 for timber frames (large pane), or
- 0.6 for timber frames (smaller pane)

Assume the factors for PVC framed windows are equal to timber.

The angle of visible sky from inside a room has been removed so that the standard is not location dependent.

When designing window apertures it is worth considering that the window area below the working plane does not significantly increase the amount of daylight falling onto the working plane. This is because the light from the lower part of the windows has to bounce off at least two room surfaces before it reaches the working plane.

A room capable of being top lit is the part of the building where roof lights can be used to provide natural daylight, this would include all single-storey buildings or rooms located on the upper most floor of a multi-storey building. Roof lights do not have to be provided where the daylight factor can be achieved from a combination of windows on the vertical plane.

Annex 7.D Example cycle and scooter parking

A bicycle stand must be capable of allowing the frame of the bicycle to be locked to the rack.

Suggested dimensions:

- All bicycle stands should be permanently fixed to a hard surface or a permanent vertical surface
- Each single stand should have the capacity to allow two bicycles to be locked by the bicycle to the stand
- A minimum distance between stands of 900mm
- A minimum distance of 500mm between stands and any perimeter line/fence
- A minimum distance of 500mm to be available at the front and rear of the stand
- A minimum length of stand to be 700mm
- Height above ground level 750mm
- Wall mounted cycle fixing rings and bars should be fitted between 700-800mm high.

Figure 7.6 Example of cycle and scooter parking

Annex 7.E Example of a dedicated internal drying area

Suggested minimum dimensions of a dedicated drying space designed to be passively heated and naturally ventilated to provide a total linear hanging length of 7.2m. 2.4m wide 1.1m deep and 2.3m high; or a volume of 6m³.

Figure 7.7 Example of passively heated and ventilated dedicated internal drying space

Suggested minimum dimensions of a dedicated drying cupboard with an independent heat source to provide a total linear hanging length of 7.2m. For example 900mm wide x 850mm depth x 2.3m with two rows of four slats or retractable pulleys each 900mm long or a volume of 1.75m³.

Figure 7.8 Example of dedicated mechanically heated and ventilated internal drying space

Annex 7.F Supplementary guidance in the aspect of optimising performance

7.F.0 Introduction

The guide should be produced in 2 stages:

- at building warrant application submit as much information as possible including the floorplan(s), an outline of the construction and building fabric, specified systems or equipment and any other environmental features, and
- re-submit at completion after review and updating of specified items as necessary.

Better design and construction of control mechanisms should make more intuitive buildings and reduce the need for user guidance.

A good practice example of a guide developed for domestic buildings is on the Scottish Government website at www.scotland.gov.uk/bsd.

7.F.1 Scope

The guide should be bespoke to the particular school containing information directly relevant to the design function of the building, as well as identifying strategies for key rooms such as classrooms, sports halls, libraries or community rooms outlining their overall heating lighting and ventilation strategies. This will allow a greater understanding on controlling their internal environment in an efficient manner. It should be tailored to be a concise non-technical 'User Information Guide' for school occupants (pupils, teachers and ancillary staff and visitors) on the operation, and environmental performance covering:

- overview of environmental strategies: both passive and active
- energy for heating
- ventilation
- energy for lighting
- water use
- recycling and waste management

- renewable technologies

Do not include unnecessary detail on the operation of the individual elements or systems of technology.

7.F.2 Format

The information within the user information guide should be concise and compact and presented where possible with graphics to aid rapid comprehension. Utilising this approach therefore means it is more likely to be kept available, used for future reference and represented as new pupils are introduced to a school.

The guide should be accessible to all, using diagrams and coloured presentations. Information should be available in digital format to allow it to be made available as a digital booklet and able to be stored online on a central server perhaps to be used as a mobile application, a digital information board or server screen savers or part of a home screen where Wi-Fi is available.

Key classrooms that are likely to be used for community or public functions such as, sports halls, libraries or community rooms should have a permanent display to inform occasional users on how to operate the building effectively.

The emphasis is to provide the information as a digital booklet. Where printed copies are required, the recommended formats should be as a booklet.

7.F.3 Graphics, images and text

The guide should include plans, locating key items of equipment and information only on the systems installed. The format should revolve around simple illustrations following the principle – ‘show don’t tell’. An illustration can be a hand-drawn sketch, a computer image or a photograph. These can be mixed because consistency in style is less important than content. Illustrations do not need to be to scale, but should show relationships and explain things quickly and easily. These guidelines should be followed:

- Use illustration where possible to focus the building user on the equipment that users normally come into contact with (e.g. heating controls and lighting controls)
- Link key components (e.g. lighting controls) to location plan to help the user to make connections between controls and systems quickly
- Images should be labelled
- Avoid non-essential images (e.g. lifestyle image) which can reduce the authority of the document
- Use graphic formats that preserve the sharpness and clarity of lines
- Illustrations should be associated with a legible caption of standard size and colour
- Many people have difficulty understanding plans, so use other images, (e.g. a simple 3D diagram alongside plans to aid comprehension)
- Use colour where possible as an easy way to differentiate categories visually. However readers may be colour blind, so use icons, illustrations and high contrast type
- Digital Text, plans illustrations and diagrams should be scalable to assist people who may have sight difficulties
- Use clear, colour, photographs (well lit, avoid use of flash if possible) or line illustrations of actual installed equipment

- Use engineer's or manufacturer's drawings as reference in order to comprehend the system but edit these to remove unnecessary items
- Do not attempt to replace the manufacturer's manuals but refer to them for further information. The main elements or products should be identified with their full names/reference model numbers and links to more information such as manuals or manufacturers websites
- Use plain English avoiding detailed technical descriptions
- Use bullet points where possible
- Avoid jargon and acronyms. If an acronym is necessary define it on first use. (e.g. MVHR (Mechanical Ventilation Heat Recovery system) is used because the acronym is more likely to lead to success in internet searches for more information.

7.F.4 DOs and DON'Ts

Provide a brief list of essential DOs and DON'Ts for occupant interaction with key teaching space and system (heating, ventilation, lighting etc). This should be specific to the heating system installed and ideally, in a colour coded text box, in a consistent position on the page.

7.F.5 Sections

Aim to fit a section relating to each of the following categories on the equivalent of a single page.

a) Overview

Give a brief description of the basic features of the school, including insulation, building fabric, heating, ventilation, renewables, lighting and hot water use and any major equipment that make a difference to how the school operates. Avoid large paragraphs. Keep under 200 words.

The overview page should include the following sentence:

This guide is produced to meet the aspect of 'Optimising Performance' within Section 7: Sustainability of the Building Standards Non-Domestic Technical Handbooks.

- Locate key parts of the equipment, annotated on a legible plan or other illustration.
- Plans should be simple and clear, generally 'planning application' standard with walls blacked in, dimensions and unnecessary annotation removed in the CAD program provider.
- Use 3D plan perspectives, axonometric diagrams, or cutaway models to aid understanding. Items to be shown include:
 - Key elements of the construction and materials - roof, walls, windows and doors
 - Elements of heating, lighting and ventilation equipment
 - Heat emitting devices
 - Control locations
 - Resource use displays
 - General information (e.g. water stop-cocks (localised and central) plant rooms, gas meters, electricity meters etc).

b) Heating

Describe how the teaching space is heated including aspects of the building fabric and ventilation that are relevant to how the system works. Cover the main principles of use in both warm and cold weather. Simple diagrams illustrating how the individual teaching space is heated and cooled in both winter and summer are useful. Avoid engineering heating system schematics as many people find these hard to understand.

Describe in around 50-100 words the main heating source in the teaching space, including the principles of operation and fuel source if relevant. Supplementary heating sources should be mentioned, where included. Provide a brief description of how heat reaches rooms e.g. radiators, under floor heating, air grilles, with illustrations provided as required. Briefly describe how heating is controlled. Illustrations and locations are required for all the main controls. Identify the reaction to heating controls (for example there may be a time lag before a heating system operates at optimum capacity) and outline the normal range if this is not obvious.

c) Ventilation

Describe in around 50-100 words how the teaching space is ventilated and the main principles for its use, in both warm and cold weather. Simple diagrams illustrating how the teaching space is ventilated in winter and summer are useful. Briefly describe how the ventilation is controlled with illustrations and locations required for all the main controls. This should include both natural and mechanical systems. Identify the elements that users have the most interaction with, so in natural ventilation, it may be trickle vents and opening of windows together with a reference to cross ventilation. For mechanical ventilation it may be the boost switch and location of filters.

d) Hot Water

Provide up to 50-100 words on how water is heated in the school, including primary and secondary systems (for example a boiler working with solar hot water panels). Consider a simple diagram illustrating how the system works if it has a number of components or options. Briefly describe how hot water generation is controlled. Illustrate the controls, identify the reaction to hot water controls (for example there may be a time lag before a hot water system operates at optimum capacity) and outline the normal range if this is not obvious.

e) Natural and Artificial Lighting

Provide up to 50-100 words on a how teaching space is lit both naturally and artificially. For natural daylight, a simple diagram illustrating how the effects the sun may have, in both the summer and winter (or bright or overcast days) including any solutions to reduce glare. Describe how manual or automatic controls for artificial lighting can reduce the likelihood of artificial lights being used when they are not required. Briefly describe how any manual artificial lighting is controlled as well as illustrating their location.

f) Other Energy Saving Features (if installed)

Cover any other energy saving feature installed as part of a passive strategy to heat light or cool a building. Include instructions for items not covered elsewhere. Each item should have a brief (around 50 words) description of other energy saving features. Identify for each item:

- Name or description
- Location
- How to control it and where the controls are located

7.G Introduction

Below is a sample sustainability label. In this example the school building has achieved the silver active level of sustainability and in addition has achieved the gold level in the aspects of energy for water heating, flexibility and adaptability and material use and waste.

7.G.1 Sample sustainability label

An example of the sustainability label

Figure 7.9 Sustainability label