



AN ROINN OIDEACHAIS  
AGUS EOLAÍOCHTA | DEPARTMENT OF  
EDUCATION AND SCIENCE

*Planning & Building Unit*

***Mechanical & Electrical  
Building Services  
Engineering  
Guidelines  
For  
Primary School Buildings***

*Planning & Building Unit  
Building Section  
Department of  
Education and Science  
Tullamore, Co. Offaly.*

*Telephone: (0506) 24300  
Fax: (0506) 51119*

*Web:  
<http://www.education.ie>*

**TGD 002**

*First Edition  
February 2004*

## Table of Contents

<b>1.0</b>	<b>Introduction</b>	<b>5</b>
<b>2.0</b>	<b>Design Philosophy</b>	<b>6</b>
2.1	General Design Philosophy	6
2.2	Mechanical Services Design Philosophy	6
2.3	Electrical Services Design Philosophy	6
2.4	Standards	7
2.5	Value for Money	7
<b>3.0</b>	<b>The Built Environment</b>	<b>8</b>
3.1	Energy Efficiency	8
3.2	Passive energy measures	8
3.3	Natural Ventilation	8
3.4	Natural Daylight.	8
3.5	Thermal Insulation	9
3.6	Acoustic Performance	9
3.7	Materials	10
3.8	Plant room locations	10
3.9	Universal Access	10
<b>4.0</b>	<b>Heating Services</b>	<b>11</b>
4.1	Fuel assessment and Selection	11
4.1.1	Oil Fuel Services	11
4.1.2	Natural Gas Services	12
4.1.3	Bulk Gas Services	12
4.2	Heating Centre	12
4.3	Boiler Plant	12
4.4	Flues and Chimneys	14
4.5	Space Heating and Distribution	14
4.6	Heating Controls	16
4.7	Insulation	17
<b>5.0</b>	<b>Water Services</b>	<b>18</b>
5.1	Mains Water Services	18
5.2	Cold Water Services	19
5.3	Hot Water Services	19

5.4	Insulation	20
<b>6.0</b>	<b>Ventilation Services</b>	<b>20</b>
<b>7.0</b>	<b>Soils and wastes</b>	<b>21</b>
<b>8.0</b>	<b>Fire Protection Services</b>	<b>22</b>
<b>9.0</b>	<b>Electrical supply</b>	<b>22</b>
<b>10.0</b>	<b>Electricity Centre</b>	<b>23</b>
<b>11.0</b>	<b>Primary Electrical Distribution</b>	<b>23</b>
<b>12.0</b>	<b>Earthing</b>	<b>23</b>
<b>13.0</b>	<b>Power Distribution Services</b>	<b>23</b>
<b>14.0</b>	<b>Lighting Services</b>	<b>25</b>
<b>15.0</b>	<b>Communication Services</b>	<b>27</b>
15.1	Information communication technology	27
15.2	Public Address System	27
15.3	Class change Bell System	27
15.4	Telephony	27
15.5	Cable and Digital Television	29
15.6	Provision for the hearing impaired	29
<b>16.0</b>	<b>Transport Services</b>	<b>29</b>
<b>17.0</b>	<b>Protective Services</b>	<b>30</b>
17.1	Door entry system	30
17.2	Intruder alarm	30
17.3	Emergency Lighting	31
17.4	Fire Detection and Alarm Systems	32
17.5	Emergency call Systems	32
17.6	Lightening Protection Systems	32
17.7	Closed Circuit Television (CCTV)	33
17.7.1	Use of CCTV	33
17.7.2	CCTV Design Issues	33

<b>18.0</b>	<b>Documentation</b>	<b>34</b>
18.1	Survey & Condition Reports	35
18.2	Budget Estimate Reports	35
18.3	Stage Submission Reports	36
18.4	Specifications	36
18.5	Drawings	37
18.6	Short-listing of Contractors for tendering	37
18.7	Tender Reports	39
18.8	Variation/Cost/Progress Reports	40
18.9	Interim Valuations	40
18.10	Final Account Reports	41
18.11	Handover Documents	41
<b>19.0</b>	<b>Inspection, Testing and Commissioning</b>	<b>42</b>
<b>20.0</b>	<b>Training and Demonstration</b>	<b>42</b>
	<b>Appendix A Completion Record Sheet</b>	<b>43</b>

## 1.0 Introduction

All Primary School projects encompassing Mechanical and Electrical Building Services which are at stage 3 or Pre Stage 3 planning at the time of issue of this document must comply with these guidelines when developing subsequent stages.

These Guidelines contain information on the design and installation of Mechanical and Electrical Building Services in Primary Schools. It is for issue to school authorities (hereinafter referred to as the Client<sup>1</sup>) and to design teams and is intended for use in the design of new schools, extensions to existing schools and the refurbishment of mechanical and electrical services.

The general design guidelines shall be read in conjunction with all other design guidelines which are available from the Department's website.

These Guidelines may be deemed to replace all previously issued guidelines for Mechanical and Electrical Building Services in Primary Schools. The Guidelines reflect recent changes in the educational system in Ireland and changes in Building Services Technology and Standards. The Guidelines are based on Engineering Applications that work and are most appropriate to the school environment and not just Best Engineering Practices.

Where it is proposed to construct a new school these guidelines shall be applied in full. In the case of existing school buildings where it is proposed to extend, convert, or renovate them, a flexible pragmatic approach will be required and an agreed brief may be established prior to the commencement of design.

In applying these guidelines to projects, Schools, Education Authorities and Design Teams Consultants will be obliged to comply in full with the Design Team Procedures and other guidance issued by the Department.

The Building Services Consulting Engineer, as a member of the Design Team, is required to provide information necessary for each stage submission. This document does not relieve the Building Services Consulting Engineers from their normal design responsibilities.

In all instances, the Department of Education & Science shall have the final say in the application of these Guidelines to projects where grant-aid is to be sanctioned. For further advice on these or any other matter, please contact:

The Planning & Building Unit  
Building Section  
Department of Education & Science  
Portlaoise Road,  
Tullamore,  
County Offaly.

Telephone: 0506 24300      Fax: 0506 51119      Web: <http://www.education.ie>

---

<sup>1</sup> In the case of Community and Comprehensive Schools the Minister for Education and Science is the Client, but for the purposes of this document the term "Client" shall also encompass the School Authorities.

## **2.0 Design Philosophy**

### **2.1 General Design Philosophy**

The different functions of the Design Team members shall be integrated, combining Building Services Engineering, Architectural Design, Structural Engineering and Quantity Surveying to create a well designed, sustainable, cost effective, durable low maintenance building.

The design shall allow repair or replacement of components of the building such as fittings, finishes and services with minimum disruption and cost. To achieve this it is essential that all disciplines within the Design Team work together from the beginning of the project and that the design is developed through collaboration by all the Design Team members.

All participants in the design process must contribute towards a common and comprehensive view of long and short-term needs of the school. All must agree at the inception of the project to the integration of the design factors for which they would normally be individually and separately responsible. This procedure shall lead to a balanced distribution of elemental costs within the overall cost target.

### **2.2 Mechanical Services Design Philosophy**

The mechanical services installation shall comprise heating, ventilation, water, soils and wastes, and fire protection services.

The design of the Mechanical Services must take into account the site microclimate, the building form and orientation of spaces, the thermal performance characteristics of the building, the occupancy trends and restrictions on pollutant emissions.

The criteria for the design and selection of the various mechanical systems shall be examined on an individual basis to provide as accurate a result as possible.

The following issues shall be included in a selection matrix format at stage 3 for appropriate mechanical systems; capital cost, running costs, replacement cost, plant space, controls, maintenance, efficiency, noise, appearance, interference with user events, response, impact on build, compatibility with natural ventilation where appropriate.

In designing the mechanical services such as the heating, hot water etc. the Design Team shall take account the possibility that parts of the school will be used outside normal school hours and design accordingly for these areas. These areas normally include the General Purpose Room and ancillary areas and associated corridors.

### **2.3 Electrical Services Design Philosophy**

The electrical services installation shall comprise Electrical Supply, Electricity Centre and Main Distribution, Power Distribution Services, Lighting Services, Communication Services, Transport Services and Protective Services.

The design of the Electrical Services must take into account the building form, the characteristics of the building, the occupancy trends and orientation of spaces.

The criteria for the design and selection of the various electrical systems shall be examined on an individual basis to provide as accurate a result as possible.

The following issues shall be included in a selection matrix format at stage 3 for appropriate electrical systems; capital cost, running costs, replacement cost, plant space, controls, maintenance, efficiency, noise, appearance, interference with user events, response, impact on build and compatibility with natural daylighting.

In designing the electrical services such as the alarms, lighting etc. the Design Team shall take account the possibility that parts of the school will be used outside normal school hours and design accordingly for these areas. These areas normally include the General Purpose Room and ancillary areas and associated corridors.

## **2.4 Standards**

To ensure the longevity of these guidelines specific mention of individual standards, which are continuously being updated, has generally been avoided.

The Design, Installation, Commissioning and Handover of the Building Services, materials, products and workmanship shall comply with the relevant prevailing Irish standards, European Standards and Directives and British Standards in that order as appropriate.

## **2.5 Value for Money**

The Building Services Consulting Engineer shall ensure that all potential costs that could arise during the execution of the contract and the installation and commissioning of services to schools are provided for inclusion at the appropriate stage and in the appropriate manner, this also includes possible capital contributions for Utilities.

In the case of a school extension where new items of central plant are to be installed which serve both the extension and the existing building (e.g. boiler, main distribution board, main fire alarm panel, etc.) the cost shall be apportioned between new and existing on the basis of floor area. The portion of cost applicable to the extension is included in the basic building cost of the extension and the portion of cost applicable to the existing building is included in abnormal costs.

Particular attention shall be given to Stage 3, where the Building Services Consulting Engineer shall ensure that all elemental costs of the Mechanical and Electrical Services are provided for inclusion in the Cost Plan for the project.

### **3.0 The Built Environment**

#### **3.1 Energy Efficiency**

An integrated design approach shall provide opportunities for energy efficiency.

The design team shall be aware that energy efficiency strategies can support each other or conflict and thus individual measures shall not be considered in isolation.

The Building Services Engineer must be involved from stage 1 onwards on these issues. The issues to be reviewed shall include site, plan form, orientation, passive ventilation and passive solar strategies and daylighting.

The Departments Energy Information Form shall be completed and included as part of the stage 3 submissions.

#### **3.2 Passive energy measures**

The use of passive energy measures to achieve a comfortable internal environment shall be employed where possible. The form of the building shall be developed to take account of the need to minimise energy consumption with particular emphasis on maximising the use of natural ventilation, daylighting, useful solar gain and minimising heat losses and unwanted heat gains.

#### **3.3 Natural Ventilation**

Ventilation where possible shall be natural ventilation by means of permanent wall vents and windows with opening sections. In determining the way in which a room is ventilated the design team shall also consider acoustic factors, maintenance factors and running costs. The ventilation area provided through permanent vents (whether in walls or windows) and opening sashes shall exceed the current guidelines set out in the Technical Guidance Documents to the Building Regulations, and shall be designed to suit the class environment having regard to the high levels of occupancy generally.

Window design must ensure that adequate natural ventilation is provided without draughts. To achieve this, opening sections must be provided at the upper part of the window, above the level of the normal occupancy zone. Full height side hung opening sections are to be avoided.

Toilets and changing areas shall be naturally ventilated. Where this is not possible, changing areas and toilets shall be mechanically ventilated. A permanent natural vent to the exterior, either directly or ducted, shall be provided in addition to any opening windows.

#### **3.4 Natural Daylight.**

All teaching spaces and habitable rooms shall have natural daylight as the principal source of light. Artificial lighting shall be used to supplement the available daylight in accordance with standards detailed in this document.



Daylight calculations are primarily in the remit of the Building Services Engineer in conjunction with the Architect.

The geometry and distribution of glazed areas shall be carefully designed to provide a high level of natural light while avoiding glare and ensuring a good quality daylighting distribution in the room with average daylighting factor in the range of 3.5 to 5.5 %.

When calculating the average daylight factor, the actual task area of the room shall be considered not the total room area; therefore areas such as storage areas and computer and wet areas if recessed behind the classroom toilets may be excluded.

The use of solid panes in the window geometry is to be avoided unless the above standards have already been achieved. All teaching areas, together with Administration and habitable rooms shall have a horizontal vista and view of the outside environment. Windowsill heights shall be a minimum of 800 mm above finished floor level. Window head height shall be a minimum of 2100 mm above finished floor level for the primary windows in a teaching space.

### **3.5 Thermal Insulation**

Thermal insulation standards shall meet or exceed the prevailing Building Regulation standards, but shall also be considered in the context of the balance of heat loss and gain so as to minimise the running costs and maintain comfort conditions.

### **3.6 Acoustic Performance**

Noise producing and noise sensitive spaces shall be located, designed and detailed so as to minimise noise interference between them. Notwithstanding the above comments, and bearing in mind that a school shall be designed in a flexible manner to permit future change, a minimum noise reduction of 40 dB is required between teaching spaces and other noise generating areas.

Acoustic privacy and security is needed in areas such as the Principal office where matters of a confidential nature may be discussed.

The elimination of the transmission of noise between spaces is a matter primarily for the Architect and Structural Engineer, however it is the responsibility of the Building Services Consultant Engineer to ensure that the building services installation does not infringe on required standards.

The design and installation of the Building Services Systems shall ensure that their operation will not interfere with the schools teaching function.

The following background noise levels (B.N.L.) shall not be exceeded.

1. All Teaching Spaces. B.N.L. 35
2. Circulation Spaces B.N.L. 45
3. General Purpose Rooms. B.N.L. 35

Mechanical services can contribute to overall noise levels, and this aspect shall receive particular attention at design stage through system design and equipment selection etc., acoustic attenuation should not be necessary through appropriate design.

### **3.7 Materials**

Building Services materials shall be selected and designed to ensure that the building and all components are durable and low maintenance and do not present a hazard to the health and safety of the users

### **3.8 Plant room locations**

Central Plant areas shall be located so as to provide for economic distribution of services. Heating centre plant room and electrical switch rooms shall not be located at the outer extremities of the building or as an annex.

The building design in the vicinity of the heating centre plant room shall allow for appropriate distribution zones for the primary services to and from the heating centre.

The location of the electrical switch room and any substations shall be taken into account when planning the distribution of services.

Plant is not to be located on roofs or positioned in such a way that requires access via a roof for servicing and maintenance purposes.

### **3.9 Universal Access**

All new school buildings and new extensions shall be designed so as to provide equal access for all. All entrances must be universally accessible. Persons with varying ranges of ability shall not be disadvantaged by design limitations.

Where design proposals involve buildings of two or more storeys, a lift will normally be required unless the same range of accommodation for all building users is available at ground floor level.

The position of the lift shall be visible from the main entrance, for further details refer to section 16.

## **4.0 Heating Services**

The heating services shall comprise fuel installation, the heating centre plant room installation, the space heating and distribution services and controls.

### **4.1 Fuel assessment and Selection**

A comprehensive fuel assessment shall be undertaken for all new and replacement works, this shall include operating costs, associated capital contribution costs and all associated builders works costs including trenching, reinstatement works and fuel storage enclosures. All costs shall be detailed and presented under the above headings.

#### **4.1.1 Oil Fuel Services**

Oil fuel storage shall be based on the actual design boiler power excluding percentages added for standby provision and shall be sized on a ratio of 35 litres per kW for central boiler installations.

Oil storage tanks shall, where security is of importance, be of cylindrical shape with dished and flanged ends, and constructed of minimum 6 mm mild steel plate. If deemed appropriate from a security point of view plastic tanks may be provided.

The tank shall include the following:

- Raised manhole access.
- Oil fill line (only if required) with full bore type valve, with locking filler cap and chain and oil type-indicating disc.
- Valved flow line to burner.
- Gooseneck (or similar) vent with insect guard.
- Sludge cock and down flow pipe.
- Hydrostatic liquid contents gauge or a continuous reading gauge with transmitter for remote reading, whichever is most appropriate.

The tank, if steel shall on erection be clean of rust and scale, both internally and externally, and painted externally with two coats of rust inhibiting paint.

To protect against polluting a method of containment shall be provided, either bunded or preferably based on a tank within a tank principal designed in accordance with prevailing standards. The latter system shall be supplied with a vandal proof leak detection gauge. The selected containment solution shall have a capacity of 110% of the tank capacity.

A positive displacement type oil flow meter of suitable capacity shall be fitted on the oil line to the heating centre plant room.

A fire valve with fusible links and deadweight shall be provided on the oil line, fitted at the point of entry to the heating centre plant room. A duplicate type oil filter shall be fitted on the oil line in the heating centre plant room.

All underground oil lines must be adequately protected against vehicle activity and corrosion preferably in a pipe within a pipe type system.

#### **4.1.2 Natural Gas Services**

Where mains gas is the fuel medium, the requirements of the supply company must be observed. Capital contributions for such supplies shall be negotiated to provide best advantage to the Client with the supplier and form part of the project cost, but not form part of the tender or contract documents.

The agreement with the gas supplier shall include for the positioning of the gas meter immediately adjacent to the heating centre plant room. The gas meter shall be enclosed in a ventilated metal secure enclosure so that the controls cannot be interfered with.

#### **4.1.3 Bulk Gas Services**

In cases where the fuel is bulk gas, the capacity shall take into account the actual design boiler power and commercially available tanks sizes. Generally only in exceptional circumstances shall it be necessary to exceed a half-ton tank size.

The provision of the gas tank is a contract between the client and the gas supplier and shall not be included in the contract documents. The provision of a base, enclosure, etc. shall be part of the building contract.

The storage tanks must be adequately secured against tampering. The regulations pertaining to the locating of gas tanks in the proximity of occupied spaces, boundaries, roadways, back filling, etc. shall be observed.

All underground gas lines must be adequately protected against vehicular activity.

#### **4.2 Heating Centre**

The heating centre plant room shall be located at ground level within the building with external doors only, opening outward. It shall be of a square shape (not L shaped or rectangular).

It shall be reasonably convenient to an access road and shall be positioned centrally so as to minimise distribution runs and it must not be annexed to or positioned on the periphery of the building.

The building design in the vicinity of the heating centre plant room shall allow for appropriate sized and accessible distribution zones for the primary services to and from the heating centre on more than one side and also include reasonable future capacity.

Where the electrical switch room or substation is located close to the heating centre plant room, care must be taken to ensure that their location does not restrict the distribution zones for primary services from the heating centre plant room.

#### **4.3 Boiler Plant**

The heating system shall be designed so that all pumps, primary control valves and boilers are housed in the heating centre. The piping and controls shall be designed so that the boilers are never exposed to thermal shock.

The boiler selection and configuration strategy shall provide a system that

- presents the most economical solution in terms of capital costs
- operates at the highest efficiency over the heating season allowing for part load
- impacts least on the environment
- maximises available plant room space ( retrofits mainly)

Over sizing of the boilers through excessive safety margins shall not occur.

It shall be standard practice that in schools of 12 classrooms or less one boiler shall be provided, in schools of greater than 12 classrooms 2 boilers on lead-lag control shall be used. Each boiler shall be sized on 60% of the required heating load excluding the hot water load.

If a more economical arrangement is appropriate then this shall be detailed at stage 3 of design for approval with the Department's Engineers. The above shall all be taken into account in a life cycle model.

In order to allow for possible future school extensions, boilers shall be positioned within the heating centre plant room so as to allow for up to one-third additional heating capacity to be installed with minimum disruption to the existing installation. Where economically feasible boilers shall be stacked. Boiler plinths, flue connections fuel lines and pipe work connections to the headers shall be positioned to accommodate additional capacity. The boilers shall be positioned with burners facing the external doors and have adequate accessible space on all sides for access and safe circulation for servicing.

Access shall be provided for the fitting and removal of boiler sections where required with minimum disruption to other plant.

Boiler flues and main pipe work within the heating centre plant room shall be accordingly sized and provided with two blanked and valved stubs on flow and return headers for future circuits.

The boilers shall be fitted with normal mountings and include pressure gauge, enclosed spring safety valve piped to low level for safe discharge, dial type mercury glass thermometer, draw off cocks with hose connections, valved flow and return outlets and vent system as appropriate.

The flow and return headers and pipes shall also be fitted with thermometer and pressure gauges and other such instruments deemed necessary for the monitoring of the heating zones.

The boiler burners shall be of reputable manufacture and fitted with all the necessary control and safety features.

Each boiler shall have a permanently fixed notice 200 mm x 200 mm screwed to the boiler casing with the following wording.

**” Important Notice. Do not reduce the boiler operating flow temperature below (Building Services Consulting Engineer to specify design figure here) °C ”**

Open or closed pressurised heating systems shall be provided on new installations as appropriate. On refurbishments / upgrades where the existing distribution system is to be maintained and is connected to an existing feed and expansion tank then the feed and expansion tank design approach shall be retained to eliminate the risk of over pressurisation of the existing systems.

#### **4.4 Flues and Chimneys**

A high quality prefabricated chimney system or a masonry chimney shall be provided for each boiler appliance. Flue dilution systems shall be avoided.

The design team shall decide on which system to be used and under whose documentation it will be covered and include details of same in the Stage 3 report.

The prefabricated chimney system shall be of twin walled stainless steel construction with a minimum of 50 mm mineral wool in the cavity, be suitable for the continuous firing gas temperatures of the boiler appliance, specified with all necessary supports, terminal, flashing and fittings and be suitable for the environment and application.

All chimney systems shall be housed within the main heating centre plant room construction and only exit the heating centre plant room at roof level.

If due to unavoidable reasons (in refurbishment projects) the flue must route horizontally for a short distance within the heating centre plant room to exit through an external wall before rising up, the base of the flue at the point of exit must be at least 2.5 m above the external ground level.

The flue system and chimney location if provided shall be such that the length of the flue system is minimised. Long horizontal routes with bends within the heating centre plant room are to be avoided.

Each flue branch shall have ample cleaning and explosion relief doors and shall be fitted with pocket test points to facilitate flue gas analysis testing and temperature reading.

Where horizontal discharge balanced flues are proposed the terminals shall be mounted not less than 2.5 m above the external finished ground level to the underside of the terminal. In the case of condensing boilers balanced flues shall be vertical discharge only to prevent plume discharge staining surrounding areas.

Where a masonry chimney is to be provided this shall be constructed with round clay tile flue liners for smaller boiler applications or using a suitable proprietary liner.

#### **4.5 Space Heating and Distribution**

The heating systems shall be low-pressure hot water via medium grade black M.S. tube and steel panel radiators. The system shall be of the two-piped flow and return type. In the case of refurbishment of existing one pipe systems, a two pipe system may not be feasible, this should be highlighted at stage 2.

Under floor heating systems are not deemed appropriate for standard school applications. If a design team is of the opinion that their application merits consideration, a detailed report, as an alternative design option only is required at Stage 2 covering all aspects of the proposal including comparative costs (both capital and running costs) and operation strategy. In calculating costs, associated costs such as additional insulation and builders work costs must be included with all elements identified separately.

The use of radiant panels maybe also considered in spaces, the intention to incorporate them in a design should be highlighted at stage 2.

The use of fan convectors are not deemed appropriate for school use due to long term maintenance issues.

The distribution of the heating services shall be integrated into the building form and design. The teaching and habitable spaces must not be used as primary distribution zones for exposed services. The distribution of the mechanical services shall not impact on the teaching environment of the school and shall not create a catchments area for rubbish etc.

In new build, the design of the heating systems and building distribution zones shall be such as to eliminate in full the need for floor ducts or services buried in the floors. This is not negotiable.

In refurbishment projects where the routing of pipe work in the floor to cross doorways is unavoidable, the pipe work shall be adequately insulated and have corrosive resistant properties, the Building Services Consulting Engineer shall witness and record these areas prior to back filling. There shall be no joints on underground pipe work.

The heating system shall be adequately valved and provided with drain cocks to facilitate sectional maintenance and repair work.

The heating system shall be divided into a number of independently controlled zones. These zones would generally be:

- Classrooms (one or more zones depending on controls, orientation, floors etc.)
- General Purpose Room & associated ancillary and corridor areas

The provision of individual room control via two port valves shall also be considered if the building configuration and piping distribution permits it.

Radiators shall, wherever possible be located under external windows but under no circumstances shall they be fitted beneath chalk/white boards. Care must be taken to ensure that radiators are not positioned so as to obstruct machinery, furniture or teaching aids. Radiators must be readily accessible and not located behind timber or other such ducting. Radiator numbers shall be selected to provide the most economical operational solution and shall not simply be provided to match the number of windows.

Radiators selection must be specified on a commercially viable basis and enable a minimum of three manufacturers to tender for supply. Column radiators shall be avoided.

Radiators shall not be located in entrance wind lobbies; the fabric finishes in these areas shall be selected for a non-heated environment and the walls and ceilings insulated. Radiators shall if at all possible be positioned so as not to be within 3 m of the external doors or the internal door of a wind lobby if provided.

Radiators are not to be positioned over lockers. In stairwells, radiators are to be located at ground floor only. The need for radiators in small internal stores, single toilets (excluding disabled) and classroom ensuite toilets is not generally necessary, if it is believed that they should be provided on a specific project, then this should be highlighted at stage 3 and submitted for approval with full supporting details.

Stores with external access only may be deemed to be external stores and are to be treated as an unheated space. In stairwells, radiators are to be located at ground floor only.

All heating pumps where appropriate shall be operated through electronic variable speed controllers. Duplicate pumps shall be provided only on the main header circulation pump in schools greater than 12 classrooms.

#### **4.6 Heating Controls**

The control strategy for the space heating shall be developed from the start of any project.

All variable temperature heating circuits shall be thermostatically controlled and include external and internal temperature detectors and motorised mixing valves.

Schools with a heating demand less than 100 kW shall have a simple boiler installation controls system comprising optimum start/ stop control and automatic frost protection as detailed below.

Schools with a heating demand greater than 100 kW shall have a controls system comprising self learning optimum start/ stop control, flow temperature compensation based on internal, external temperatures, motorised valved zone control, maximum internal and external temperature automatic cut out and automatic frost protection as detailed below.

The controls shall include a manual override with run on timer so that heating is available for occasional out of hours use. This shall be located within the school office or staff room, whichever is nearest to the heating centre plant room. This unit shall be of a type appropriate for its location in terms of aesthetics and size. Industrial housing shall not be acceptable.

Holiday switching shall also be provided on the heating centre plant room control panel.



The positioning of zone sensors shall be carefully considered to allow for areas with different heat gains and other variables.

The heating centre plant room control panel and secondary plant rooms shall incorporate a BMS outstation for schools with eight classrooms or greater. Holiday switching shall also be provided on the heating centre plant room control panel.

All wording on the control panels shall be agreed with the Client beforehand. Use of terminology such as zone 1, zone 2 on its own shall not be acceptable. The actual zone shall be defined on a colour coded A3 drawing, which shall be laminated, framed and fixed on, or immediately adjacent to the panel on a timber backing screwed to the wall. No abbreviations are to be used on the panel without an explanation in full provided on the drawing.

A remote monitoring and control system indicating the status operation, and overriding facilities shall be provided in the Administration Office or staff room whichever is nearest to the heating centre plant room. This shall include a manual override with a selective switch of up to 3 hour run on timer so that heating zones are available for occasional out of hours use. This unit shall be of a type appropriate for its location in terms of aesthetics and size. Industrial housing shall not be acceptable.

Due to vandalism and operational difficulties in a school environment, thermostatic radiator valves are only to be used in staff areas. The provision of individual room control via two port valves shall also be considered if the building configuration and piping distribution permits it.

The heating systems shall be such as to maintain a minimum even temperature of 18 °C in all teaching and habitable areas.

Two-stage frost protection shall be provided and so arranged as to activate circulating pumps at internal temperatures below 5 °C and fire the boiler burners when system return temperatures drop to 2 °C. The frost protection system shall be independent of the optimum start controllers.

#### **4.7 Insulation**

Where heating pipe work is not being used as a useful heating surface, insulation of appropriate thickness and quality shall be applied. The insulation shall be of preformed sections of rigid mineral wool incorporating an aluminium foil laminate cover and fitted in accordance with the manufacturers instructions. The insulation shall also be applied to all connections, bends, tees and valves.

Proprietary jackets with Velcro fixings shall be used on all valves over 32 mm. Additional taping every 2 m shall be provided on the insulation within the heating centre plant room.

## **5.0 Water Services**

The Water Services shall comprise mains water supplies, cold and hot water installations. The mains, cold and hot water distribution services shall be gravity systems. This is not negotiable as the schools sanitary systems must be capable of operating during school hours in the event of a power outage.

Cold and hot water shall be supplied to each wash hand basin via a single low-pressure drop anti scald percussion spray type tap. All sink units shall be anti scald with a manual-mixing unit with mains and hot water supply.

The above basin and sink fittings are the remit of the Project Architect and shall form part of the main contract. The Building Services Consulting Engineers shall approve all outlet fittings for compatibility (with respect to pressure drop through the fittings) with the gravity water systems.

The cold and hot water piping shall be appropriate for use and where exposed must be of rigid construction.

The water systems shall be designed to ensure water hammer and air locking does not occur and shall be provided with an adequate number of isolating valves for the purpose of isolation and maintenance.

### **5.1 Mains Water Services**

The Capital Contribution for Local Authority water connection shall be included in the project cost but not in the tender contract documents.

The design of the external water mains shall be within the remit of the Structural Consulting Engineers and shall form part of main contract. The incoming mains shall enter the building in the heating centre plant room and be fitted with a stopcock. The Building Services Consulting Engineer shall advise on the incoming water flow rate and pressure requirements and shall be responsible for the internal water services design beyond this stopcock. The internal water services shall be part of the mechanical contract.

The external water mains design shall be determined by available water pressure, bore size or Local Authority requirements. Joints, connectors and other associated fittings shall be in accordance with the relevant manufacturers instructions. The services shall be appropriately valved. Valves shall be located in suitable chambers with suitably labelled heavy-duty cast iron hinged access covers.

A water meter with a recording section that can be removed without interfering with water flow shall be provided on the incoming mains immediately inside the site boundary, this shall have a hinged access cover as above. A secondary water meter shall be provided on the incoming mains immediately after the stopcock within the heating centre plant room. External mains and fittings shall be located at least 750 mm below topsoil level. Suitable backfilling and other protection shall be provided in accordance with the site conditions.

External taps (one per 150 pupils up to a maximum of 3 taps) of the low-pressure drop percussion type for drinking water shall be provided in a number of locations

in the external play area complete with a ball fix valve positioned internally in an easily accessible place for isolation out of school hours on the supply pipe to the external tap.

The dead leg distribution pipe to all outlets shall be kept to a minimum in accordance with prevailing standards.

## **5.2 Cold Water Services**

Cold-water outlets shall be as indicated on the Room Layout drawings.

For cold-water storage an insulated sectional GRP tank suitable for the provision of potable water to Format 30 shall be used. For ease of maintenance, the provision of cold water storage shall be centrally located with easy all round access. It shall not be located in the boiler plant room. The actual capacity of the cold-water storage tank shall be calculated at 20 litres per student (with 20 % expansion capacity within the tank for a new school).

The tank and tank sections shall be located so that it is possible without any fabric / structural changes to repair or replace any sections of the tank. All tank/s must be supplied with lightweight covers and fitted with drip trays. Provision shall be made in the tank cover for access to the ball cock. Overflow and warning pipes to the tank and drip tray shall be incorporated discharging at a point of nuisance.

## **5.3 Hot Water Services**

The hot water system may comprise of either an indirect hot water cylinder with an integral high recovery multi coil heat exchanger, a gas fired instantaneous hot water generator with minimum storage/ buffer tank, electric water heaters or a hybrid of all three solutions.

A suitable hot water supply strategy shall be established, this will take into account available fuel sources, hot water demand and energy efficiency, The selection process shall be outlined at Stage 2 complete with all factors and costs.

Where an indirect hot water cylinder with an integral multi coil heat exchanger is provided, electrical immersion heaters are not required for back up. The maximum heat up time to 65 °C of full contents from cold shall be 1 hour. The hot water load shall not be included in the boiler load calculations (for schools greater than 4 classrooms) and the boiler controls shall be designed to give priority to the hot water heating when demand requires it.

The hot water system capacity shall be based on hourly generation rather than on daily storage usage. A figure of 0.5 litres per hour generation shall be provided per pupil up to the following maximum rates.

- 45 litres per 4 classroom school.
- 80 litres per 8 classroom school.
- 160 litres per 12 classroom schools or greater.

Where electric water heaters are proposed these shall be controlled by a seven day timer set to eliminate standing losses out of school hours. Storage shall be

kept to a minimum. Sanitary and sink layouts shall be configured to maximise the option of one unit serving a back to back layout or stacked in multi floor schools to allow one unit to serve more than one area subject to maximum dead leg requirements.

Adequate provision for hot water in an economical manner shall be allowed for cleaning purposes outside of main school teaching hours.

All hot water heaters shall be complete with all necessary controls, safety devices and instruments. A suitable single hot water recirculation pump shall be provided on any central storage distribution hot water systems, the pump shall be located adjacent to the hot water heating unit.

All hot water outlets (excluding the cleaners sinks) shall be provided with hot water outlets with fail safe lockable local thermostatic blending valves limiting maximum temperature to 43 °C to prevent scalding. Where washbasins are adjoining or back-to-back these shall be combined to the one blender unit.

An individually controlled thermostatic mixing valve and flexible hose and showerhead shall be provided in the universal access toilet. This is a multi user suite and all services shall be designed and installed accordingly.

A wall mounted steam free instant boiling water heater shall be provided in the staff room and servery area. This shall be sized based on 2 cups per classroom up to a maximum size of 5 litres storage. It shall be controlled by a seven day timer set to eliminate standing losses out of school hours.

#### **5.4 Insulation**

All distribution cold water services pipe work in locations likely to give rise to freezing or condensation shall be appropriately insulated as a continuous vapour barrier. All distribution hot water services pipe work shall be appropriately insulated.

The insulation shall be of preformed sections of rigid mineral wool incorporating aluminium foil laminate cover and fitted in accordance with the manufacturers instructions. The insulation shall also be applied to all connections, bends, tees and valves. Proprietary jackets with Velcro fixings shall be used on all valves over 32 mm. Additional taping shall be provided at 2 m intervals on the insulation within the heating centre plant room.

Hot water cylinders shall be specified as pre insulated by the manufacturers with high-density insulation.

Appropriate colour identification bands and flow directional arrows shall be affixed to all insulated pipe work.

#### **6.0 Ventilation Services**

While the majority of the school accommodation will be ventilated via natural ventilation in accordance with the Building Regulations, areas such as Internal Toilet (where unavoidable) will require mechanical extract.

These systems shall be designed in accordance with the prevailing Building Regulations and the Chartered Institute of Building Services Engineers CIBSE Design Guides.

Extract rates shall be based on litres / sec per person or appliance or canopy velocity, air changes per hour as a design methodology are to be avoided (excluding toilets).

There shall be no need for treated mechanical supply air to the above spaces.

Make up air to all areas shall be via natural means assisted if necessary by the extraction system. Permanent vents shall be provided independent of the window systems in all areas.

All fans where appropriate shall be operated through variable speed controllers.

Systems shall in general be localised with minimum ducting and local exhaust louvers, the extract ducting from one room shall not route through adjacent rooms. Ventilation ducting shall not be routed through fire rated enclosures or heating centre plant rooms. Any ducting shall be formed and installed in a neat manner and where exposed shall be aesthetically acceptable.

Extract ventilation shall be via wall or ceiling grilles. Floor grilles or door transfer grilles shall not be used, where make up air is required to rooms, then this shall be achieved by undercut doors or high level wall transfer grilles.

In the staff room a proprietary domestic style canopy with integral fan and grease filters will be required above the cooker and this canopy shall exhaust local to the cooker unit.

In internal single/ double cubicle toilets if mechanical ventilation is required it shall be controlled via the lighting switch with run on timer. All toilets shall have permanent natural ventilation in addition to any other ventilation, ducted passively if necessary to the exterior. Mechanical ventilation in internal toilets shall be based on 8 air changes per hour.

Stores shall have permanent natural ventilation only, ducted passively if necessary to the exterior.

## **7.0 Soils and wastes**

All soils and wastes (above ground) are the remit of the Building Services Consulting Engineer and shall be included in the mechanical tender contract documents. The provision of sanitary ware and associated taps, traps and fixing brackets the remit of the Architect with agreement of the Building Services Consultant Engineer and shall be included in the main tender contract documents.

Generally, soils and wastes shall be run in PVC piping and shall include vents, cowls and anti-siphon traps to all fittings as appropriate. All joints in soil and

wastes runs must be made with the appropriate solvent, fusion socket or synthetic O-rings.

Wastes shall include sufficient blank caps and cleaning doors for access for cleaning rods.

## **8.0 Fire Protection Services**

Adequate protection services to enable the building occupants to evacuate safely against the risk of fire shall be provided in the form of hand held type fire extinguishers and fire blankets.

A protective system shall be designed and a specific layout drawing produced indicating positions of fire extinguishers and fire blankets. These shall be a combination of the water, dry powder and carbon dioxide suitably sized for easy use by a single individual.

Hose reels are not to be provided for first aid fire fighting in new schools. In existing schools they shall be removed as part of any refurbishment of the mechanical services and replaced with an appropriate number of hand held extinguishers.

Where automatic extinguishers are suspended in heating centre plant rooms above burners they shall be fixed to an appropriate rigid frame so that they cannot rotate freely when discharging under pressure.

The design of the external ring main with hydrants shall be within the remit of the Structural Consulting Engineers and shall form part of main contract. It shall be provided in accordance with the Local Authority requirements. Hinged hydrant boxes of heavy-duty construction shall be provided.

## **9.0 Electrical supply**

The supply to the building shall be taken from the national grid. The incoming supply shall be trenched underground in such a manner that it is outside the zones identified for future extensions to the building.

The Capital Contribution for supply and connection shall be included in the project cost but not in the tender contract documents.

Where a substation is required by the electrical supplier this shall where possible be a standalone proprietary unit near the school boundary and not an integral part of the school building.

The client shall be advised at Stage 2 of the various service supply providers to enable them to consider the most economical supply contract. The load requirement shall be reviewed again at stage 4 following detail design and agreement documents amended accordingly.

The metering tariff shall be to the best advantage of the Client. The proposed tariff shall be considered as part of the design process and detailed at stage 4 of the design process.

## **10.0 Electricity Centre**

The Electrical Switch Room shall be housed in a dedicated room/ cupboard located on the ground floor and in association with an external wall and shall have internal access. The room shall be located so that it does not present difficulties for services distribution from adjoining plant spaces or rooms and it shall be located so as to provide for economic distribution of services.

The main switchboard shall be of metal clad cubicle design to approved standards and regulations. Each switchgear assembly shall have a minimum 25% spare capacity. Electronic surge protection shall be provided on the incoming mains.

## **11.0 Primary Electrical Distribution**

The distribution system between the main switchboard and distribution boards shall be concealed in so far as is practicable, yet be accessible without disturbing the building fabric. Galvanised trays, trunking or conduits as appropriate shall be used to carry electrical distribution cables.

The distribution boards shall not protrude into circulation spaces and shall be located within built fire-stopped construction with appropriate door closures.

## **12.0 Earthing**

The electrical installation including all fluorescent light fittings shall be properly earthed in accordance with the relevant E.T.C.I. National Rules For Electrical Installations and ESB regulations

Earthing connectors to pipes etc. shall be done in a neat manner and shall be aesthetically acceptable, preferably in an area where student access is restricted.

## **13.0 Power Distribution Services**

All sockets shall be of switched 3 pin, 13 amp capacity, surface or flush mounted depending upon building construction. The proposed method shall be detailed at Stage 3 and noted on all drawings from stage 3 on.

Circuits shall be carried in galvanised steel conduit and cable trunking as appropriate. Surface boxes shall be specified without manufacturers knockouts.

Socket surface plates shall be of metal clad finish only and be engineered to fit flush with the back box.

Two number 13 Amp twin sockets shall be provided in each teaching space at the front and back of the room. Sockets shall be mounted 300 mm above the finished floor. One double socket shall be provided per corridor area.

Additional sockets shall be provided for computer use, for details on power distribution services for computers refer to the Department of Education and Science guidance document "*Information and Communication Technology (ICT) Infrastructure Guidelines for Primary Schools*".

The following schedule identifies the provision of double power outlets in various rooms excluding those for computer usage.

<b>Room</b>	<b>Number of power sockets</b>
General Classroom	2
Library & Resource Area	4
General Purpose Room	4
Multi Purpose Room	2
Learning Resource Room	2
Home Liaison Room / Parents Room	2
Administration / General Office	4
Principal Office	2
Teachers room (up to 8 Classrooms)	2
Teachers room (> 8 Classrooms)	3
Plant room	1
Main Switch Board Area	1
Photocopier Area	1
Corridor	1

Power outlets and associated services in the General Purpose Room are to be located one on each wall and be flush mounted.

Power outlets to water heaters, water boilers and cookers shall be suitably rated and switched with neon indicator.

Where electric water heaters are proposed a seven-day timer, set to eliminate standing losses out of school hours, shall control these.

In the case of refurbishments of power layouts where possible the new layout shall maximise the re-use of existing conduits etc.

The supply and installation of hand dryers are not grant aided for hygiene reasons and shall not form part of any contract or tender documentation.

All heating centre plant room plant and equipment shall be appropriately wired through the heating centre plant room control panel. A remote monitoring and control system indicating the status operation, and overriding facilities shall be provided in the Administration Office or staff room whichever is nearest to the heating centre plant room. This shall include a manual override with a selective switch of up to 3 hour run on timer so that heating zones are available for occasional out of hours use. This unit shall be of a type appropriate for its location in terms of aesthetics and size. Industrial housing shall not be acceptable.

Energy efficient motors shall be specified on electrical plant items including variable speed drives where appropriate.



## **14.0 Lighting Services**

Lighting to provide appropriate illumination shall be provided and shall be of the correct intensity and colour.

A light level of 300 lux shall be provided in the General Purpose Room (measured 1.5 m above the playing court) and in Classrooms and teaching spaces at 700 mm above the finished floor level. In toilets, circulation and entrance areas a light level of 120 lux at 700 mm above the finished floor level shall be provided.

The light fittings shall be of good quality, robust and be easily maintained. All spaces, including tank rooms, shall have artificial lighting.

Linear high frequency fluorescent type, with opal diffusers shall be used in teaching, circulation and General Purpose Room areas.

Non-Thermoplastic diffusers are to be used on escape routes and wire guard protection is to be provided on the light fittings in the General Purpose Room.

Suspended lighting and uplighting shall not be used in the interest of safety, maintenance and energy efficiency. In the case of retrofitting where there are high ceilings (> 3.5 m) in existing buildings suspended light fitting may be considered if appropriate (excluding GP Rooms). This should be highlighted at stage 3.

Feature light fittings for notice boards, display cabinets and other such objects shall be provided based on two fitting per 100 pupils with a maximum of 10 per school. The selected light fitting shall contain energy efficient lamps.

Linear CAT 2 type high frequency fluorescent fittings shall be provided in office areas and staff rooms.

Compact fluorescents shall be used in the main reception entrance areas for decorative lighting and shall also be used in small stores.

Toilet cubicle partitions shall be terminated below ceiling level so that the toilet area can be treated as a single space in arriving at the number of light fittings required.

Appropriate lighting in shower areas shall be positioned outside the cubicle wet areas i.e. in the common circulation spaces.

Fittings shall not be located so as to present health and safety difficulties in tube replacement. Tube selection shall be based on the most energy efficient and economical solution available. The positioning of light fittings shall not give rise to shadows or glare.

The operation of lighting in each space shall be contained within that space. The switching of lights in teaching areas shall be so arranged that natural daylight may be maximised and individual rows serving areas benefiting from daylight can be separately controlled.

In teaching spaces automatic lighting controls shall be based on manual on / off switching, absence detection and daylight sensing, so that lights will need to be switched on manually and will dim/ turn off automatically depending on the signals from the automatic controls.

In corridors where some areas may benefit from external glazing and others not, the lighting shall be zoned to take account of the various daylight influences.

Where possible highly reflective natural light tubes shall be incorporated into corridor design to maximise the use of natural daylight. Where used these may if practical be fitted with an integral electric lighting fitting with low energy lamp.

Light switches shall be standard plastic light switches where recessed and metalclad finish with grid type switches where surface mounted and be engineered to fit flush with the backbox.

Light switches and associated services in the General Purpose Room shall be flush mounted.

The lighting circuits shall generally be run in galvanised steel conduit, surface or concealed, depending upon building construction.

The light switches to stores etc. shall be push type with auto time delayed release and be positioned on the internal wall of the room on the side opposite to the door hinges.

In the case of refurbishments of lighting systems where possible the new layout shall maximise the reuse of existing conduits etc.

Lighting in ensuite and student toilet areas shall be controlled via a proprietary lighting system based on presence detection in conjunction with ventilation and urinal flushing controls if appropriate.

External lighting shall consist of high level wall mounted bulkhead type fittings, where this is not achievable, lights mounted on hinged high columns (for tube replacement without raised platforms) shall be considered in areas such as car parks, driveways, pedestrian ways, and entrance/exit locations.

All facades of the building where access is possible shall be lit, it is critical that the lighting does not provide a floodlight facility for out of hours playing, congregating etc or a glare problem.

Shielded low pressure sodium units shall be incorporated into the lighting design with timer switches and daylight sensors and be preferably mounted under the eaves.

The controls for the car park lighting and the external façade lighting shall comprise separate timers and hand –off – auto switches. External lighting shall be subject to intruder alarm override.

Fittings and Columns shall be robust and of vandal resistant quality.

## **15.0 Communication Services**

The communication services shall comprise Information Communication Technology Systems, Public Address Systems and Telephony systems and Cable and Digital Television Service. Details of provision for the hearing impaired are also noted in this section.

### **15.1 Information communication technology**

The Department of Education and Science guidance document *Information and Communication Technology (ICT) Infrastructure Guidelines for Primary Schools* clearly sets out the requirements for the ICT Systems and shall be referred to for complete details of these systems.

### **15.2 Public Address System**

Two way public address system shall be installed with speakers in schools of 8 classrooms or greater to all teaching spaces, offices, circulation areas and General Purpose Room.

The system shall consist of the following:

- Desk mounted console, containing amplifier, room selector switches with one master switch, input socket: for microphone lead and other external source lead.
- One gooseneck microphone
- Wall mounted speakers
- Automatic class call system operating through a 24 hr master clock system complete with external sounder.
- A separate microphone outlet jack in the General Purpose room.
- Reproduction facilities for recordings and broadcasts.

The Public Address Control unit shall be located in the Administration Offices. The speakers shall be positioned on the corridor wall near the corner adjacent to the teacher's wall 1.6 m above the finished floor level.

### **15.3 Class change Bell System**

In eight classroom schools or greater the Automatic Class Change System shall be provided as part of the Public Address system as detailed above.

Class change systems in Schools less than eight classrooms shall be manual via a hand held bell. All Class change sounders must have a distinct sound to any other sound activating unit.

### **15.4 Telephony**

A PABX system (including all handsets & payphones) located in the Data Communication Centre shall be tendered, installed and commissioned directly by the Client as part of the loose furniture and equipment contracts. It shall be capable of taking the exchange lines (ExchL), and telephone extensions to the rooms as detailed below. The system shall have spare capacity for at least five telephone extensions.

All associated wiring and outlet points are in the remit of the Building Services Consultant Engineer and shall form part of the Electrical Tender Documents.

Telephony shall be a CAT 5e cable system with RJ45 sockets. For Telecom Outlets presentation, conduit is acceptable.

The following guidelines shall be used relating PABX and direct line facilities to school size:

1-4 classroom school

- 2 lines for the PBX
- 1 line for Internet to Data Communication Centre
- 1 line for Intruder alarm/ fire alarm monitoring
- 1 line to a call card telephone

1-8 classroom school

- 2 lines for the PBX
- 1 line for Internet to Data Communication Centre
- 1 line for Intruder alarm/ fire alarm monitoring
- 1 line to a phone / facsimile machine in the principals office
- 1 line to a call card telephone

1-16 classroom school

- 3 lines for the PBX
- 1 line for Internet to Data Communication Centre
- 1 line for Intruder alarm/ fire alarm monitoring
- 1 line to a phone / facsimile machine in the principals office
- 1 line to a call card telephone

<b><i>Type of Space.</i></b>	<b><i>Telephone Points</i></b>
Principal's Office.	1 T Ext 1 ExchL (phone & fax machine).
General Office.	1 T Ext
Staff Room	1 T Ext
Social Area	1 Call Card Telephone
Data Communication Centre.	1 T Ext, 1 Exch L for WAN connection.

All connection charges payable to the telecommunications provider will form part of the project cost but not part of the contract costs. The client shall be advised of the various service supply providers to enable them to consider the most economical supply contract.

The full telecommunication service shall be fully operational at the time of the building hand over.

The provision of the Call Card telephone is a Client decision. If required it shall be readily accessible to staff, pupils and visitors / community. It shall be positioned so as not to impede circulation.

The direct line (ExchL) to the Data Communications Centre is for Internet (WAN) connection. The supplier of ICT equipment selected by the client shall make the final connection to the networking equipment.

### **15.5 Cable and Digital Television**

Where a cable or digital system is available locally, the Client if they wish should negotiate a connection and the incoming system shall be provided under the electrical contract terminating in the Data Communication Centre, this will allow the school if they wish to record TV Programs for distribution via video within the school.

The capital contribution shall form part of the project cost but not part of the Contracts.

### **15.6 Provision for the hearing impaired**

Generally provision for hearing impaired persons shall be via a portable loop systems or personal infrared equipment. These are not to form part of the building contract; they are treated as an equipment item between the Department and the Client.

The need for provision for hearing impaired persons at the reception area shall not arise, as these areas shall have opening hatches for one to one contact.

### **16.0 Transport Services**

Suitable provision for access to any storey above or below entrance level shall be provided as per the requirements established in the prevailing building regulations.

The design solution shall take into account the number of floors and travel distances involved, expected usage demand, maintenance costs, ancillary space requirements, builders work and life cycle costs.

Traditionally, lift usage profiles for schools are low and platform type lifts with powered doors address many of the above requirements and their use is encouraged as a standard solution.

Where a platform lift is not deemed suitable for a particular school a hydraulic or traction passenger lift car application may be considered. Following consultation with the school the design team shall submit as part of their Stage 2 report an analysis of the schools requirements together with recommendations and supporting detailed data.

The location of the lift shall be adjacent to the main school entrance and visible from the main doors. It shall where possible be an integrated design solution within the same fire compartment and present itself as a feature in the main circulation area rather than be located on a dead end corridor. The lift shall not reduce the minimum width requirements for circulation within its vicinity.

The clear dimensions of the internal floor of the lift shall be 1400 mm x 1100 mm with a clear door opening of at least 880 mm. An emergency alarm system shall be provided in the over all design solution. Glazed cladding shall be considered.

Lift access shall be controlled by means of key or magnetic strip.

## **17.0 Protective Services**

The protective services shall comprise Door Entry System, Intruder Alarm System, Emergency Lighting, and Fire Detection and Alarm Systems, Emergency Call systems, Lightening Protection and Closed Circuit Television.

Each school will require different solutions and a security design strategy shall be developed with the Client to take account of the schools particular and unique requirements. As such and as detailed in the Department's Planning and Building Guidelines a holistic approach to security is required and the protective services to be successful are provided to compliment this approach not to substitute for it.

### **17.1 Door entry system**

In the design of the main entrance and the reception office a natural view must be maintained between the reception office and the front door entrance area.

A simple door entry system capable of two-way communication shall be provided (to control entry at the internal door of the school entrance lobby) complete with remote release facility. The unit shall comprise a single button vandal resistant, flush mounted stainless steel entry panel complete with microphone and speaker.

The two way communication unit with integrated buzzer shall be provided at the hatch connecting this area to the admin office, this hatch will also need to match the physical security provision of the internal door.

An internal wall/ desk mountable handset with release button shall be located in office area. Toggle switches shall be installed so that the intercom handsets could be switched off during staff breaks.

The magnetic lock shall be provided on the internal frame of the internal lobby doorframe with correct mounting brackets and appropriate power supply unit with standby battery to power this unit.

An egress button shall be located in the proximity of the door to allow individual exit from the school. The unit must de-energise releasing the door in the event of the fire alarm activating.

A door call bell (with sounder located in the corridor adjacent to the admin office) shall be located outside the main front door for out of hours use.

### **17.2 Intruder alarm**

An intruder alarm system shall be designed in accordance with prevailing standards. The system shall be supplied and installed by certified companies under the National Standards Authority of Ireland or equivalent.

A certificate of compliance will be required on completion of the works as will a unique reference number from the Garda Authority for monitoring response.

The systems shall generally comprise of dual tech passive infrared detection located in ground floor perimeter classrooms, circulation/assembly areas, offices, all specialist rooms and all external stores and plant rooms either via hardwiring or using wireless technology which ever is the most economical and reliable. Maintenance issues should also be considered.

Detectors shall also cover first floor corridors and areas that may be accessible from single storey roofs. The motion detectors shall be positioned facing the external points of entry to a room.

The use of door contacts or inertia sensors is to be avoided. Externally accessed stores and plant rooms are to have suitable protection.

The system shall be linked to an appropriate monitoring station. This monitoring centre shall comply with the current Irish and European standards. A separate phone line shall be provided for the alarm system to allow the line status to be monitored.

Double Push Alarm Units shall be provided in the General Administration and Principals Office.

Wireless panic attack systems for yard supervision consisting a belt clip with a transmitter worn by Supervisors in the play yard shall be provided. These shall link via a receiver into the main schools intruder alarm system.

Activation of the intruder alarm shall also activate all external lights during darkness.

The fire alarm system shall be connected to the digital communicator on the intruder alarm system. When the fire alarm triggers, a fire alert signal shall be transmitted to the 24-hour central station.

All surface mounted cables are to be concealed in plastic trunking, low voltage compartments or attached to cable trays.

### **17.3 Emergency Lighting**

An emergency lighting system shall be provided with central test unit in accordance with prevailing standards. It shall generally consist of non-maintained, self contained, emergency lights and Exit Signs.

Where possible emergency exit signs shall be provided only in the circulation escape routes. Each light fitting shall have a minimum 3-hour duration and be complete with a neon-monitoring pilot.

#### **17.4 Fire Detection and Alarm Systems**

In most cases an analogue addressable fire Alarm system shall be installed in accordance with prevailing standards. This will generally consist of a continuously monitoring indicator panel equipped for fault detection, battery charger condition, low voltage zone testing, activated alarm zones and muting facilities.

In smaller buildings a zoned conventional fire alarm system may be more effective or economical and may be considered.

The detector heads shall include a condition indicating light.

Automatic door release mechanisms shall be provided on corridor fire doors and shall be electrically linked to the Fire Alarm System. These shall be supplied as part of the main contract and wired under the Electrical Contract.

The fire alarm system shall be linked to the main gas services valve (if applicable) for isolation of the gas supply on activation of the fire alarm system.

A Fire Alarm System shall be provided to an L3 standard unless a higher standard is required and shall be either via hardwiring using fire resistant cabling or using wireless technology which ever is the most economical and reliable. Maintenance issues need also to be considered.

All surface mounted cables are to be concealed in plastic trunking, low voltage compartments or attached to cable trays. Vertical drops from the ceiling to break glass units shall be in galvanised steel conduits.

A fire alarm sounder must be provided externally in the general location of the fire alarm control panel. Fire alarm sounders must have a distinct sound to any other sound-activating unit.

All manual call point units are to be of the fully resettable type via key operation. The use of breakable glass in the call units is to be avoided.

#### **17.5 Emergency call Systems**

An emergency alarm system shall be provided in the disabled toilet suites. These shall comprise ceiling pull cord with audio alarm unit located outside the area at high level.

#### **17.6 Lightning Protection Systems**

A lightning protection system shall be provided if necessary in accordance with prevailing standards.



## **17.7 Closed Circuit Television (CCTV)**

### **17.7.1 Use of CCTV**

A Closed Circuit Television System shall be provided in all new schools as a means of monitoring and recording the main school entrances.

### **17.7.2 CCTV Design Issues**

Systems shall be designed so that the specification is open enough to allow any competent CCTV installer to tender for the contract, but sufficiently specific to ensure that competing companies cannot gain an unfair advantage by quoting for inferior equipment.

The CCTV System shall also be designed to compliment the operational requirement and management strategy for the school.

The CCTV system shall comprise of a digital recording and monitoring facility, one dome camera to cover main entrance lobby, one external camera to monitor the school approach road.

The CCTV system installation shall not be covert but rather be visible.

The digital recording system shall comprise Hard Disk Recorders (HDRs).

The system shall be capable of recording at 30 frames per second while recording from up to 16 cameras simultaneously and maintaining multiple 1,4,6,8,9,10,12,16 camera split screen viewing as a minimum and multiple 1,4,8, or 16 camera split on playback.

The system shall be capable of image transfer to CD complete with a digital watermark.

Recording shall ideally be based on smart recording technology with time lapse and with software movement detection.

A 17inch high-resolution colour displays monitor shall be provided. It shall be located in the Principals Office, general office or staff room (to be agreed with the Client) to ensure optimum viewing distance and shall take into account room aesthetics, glare on the screen, heat production etc.

The dome camera shall be a colour camera with auto iris camera to cover main entrance lobby.

All external cameras shall be black and white with auto iris. Each camera shall be contained in a housing suitable for its intended environment with a heater and thermostat. The lens shall have a minimum range of manual focal length adjustment.

The typical school system shall comprise of the main system as detailed above and the entrance lobby camera and one external camera located on the building to cover the main approach to the school.

Where the above is not deemed suitable for a particular school additional coverage may be considered. Following consultation with the Client and completion of a security audit the design team shall submit as part of the Stage 2 report an analysis of the school requirements together with recommendations and supporting detailed data.

Where the need for an extended External CCTV System has been agreed the approach externally shall be to provide what may be described as a camera curtain a reasonable distance back from the façade through which any one approaching the building will have to walk through. This arrangement would be based on cameras mounted on columns.

It shall not be necessary to provide cameras to look at every recess or projection of the building. Therefore the basis for this design shall be a rectangular shape layout of cameras with cameras looking towards each other.

If a school wishes to extend the basis system at its own expense, the spare capacity on the monitoring and recording system may only be used for external cameras. It is not the Departments policy to fund internal CCTV systems.

## **18.0 Documentation**

All reports as outlined in this section must comply with the following requirements. The provision and accuracy of required information in any report is critical so as to avoid unnecessary delays.

A4 size white paper, of good quality shall be used and only one side of the paper shall be printed. The type size and character used in the main text shall be Arial 12.

Margins at the binding edge shall be not less than thirty millims and other margins not less than fifteen millims. Single spacing shall be used.

Pages shall be numbered consecutively including appendices but excluding photographs and/or diagrams, which are not embodied in the text. Page numbers shall be located in the bottom centre of each page.

A detailed contents page shall be included with corresponding page numbers. In electronic format the contents page shall be interactive.

The title page shall give the following information in the following order,

- Full title of the document
- Revision number and date
- Consultants details
- Name and address of the school

Details of the personnel dealing with the project should be noted inside the report.

There shall be a summary of the report not exceeding 500 words in length. This shall provide a synopsis of the report. Where abbreviations are used a key shall be provided. Appendices shall follow the main text. Appendices may consist of

supporting material of considerable length or of lists, publications, tables or other information, which, if included in the main text, would interrupt its flow.

### **18.1 Survey & Condition Reports**

A survey and condition report shall be presented as outlined above and contain details of the services inspected, date of inspection and inspection personnel.

The Building Services Consulting Engineer shall provide fully outlined information using the following four sub headings;

- Condition Review
- Comment and Analysis
- Recommendations
- Budget costs

on the each service inspected and these shall be itemised under the National Standards Building Elements. The age of the systems inspected and capacities shall also be detailed.

The report shall also include detail commentary of the energy efficiency of the various services and recommendations with simple payback analysis for improvements. An overall summary of recommendations shall be included in the report, as shall a summary schedule of all budget costs.

All services to be reported on shall be inspected where visible. The Building Services Consulting Engineer shall arrange for suitable access to high level services and tank rooms where required. Partial inspection reports will not be accepted.

### **18.2 Budget Estimate Reports**

Where the Building Services Building Services Consulting Engineer is the sole consultant with responsibility for costs, budget costs shall be provided on each service along with a description and be itemised under the National Standards Building Elements.

The budget cost must include

- An allowance for any general builder's work that will be required
- Preliminaries and insurance costs
- Value Added Tax at the appropriate rate(s)."

The report must make it clear whether consequential reinstatement or re-decoration work is included or excluded.

Where a Quantity Surveyor is employed as a member of the Design Team, the Building Services Building Services Consulting Engineer shall forward a copy of the budget services costs and condition report to the Quantity Surveyor together with a schedule of major builder's work. The Quantity Surveyor will then incorporate the services costs into the overall estimated cost of the project and forward his report to the Client through the Design Team leader.

### **18.3 Stage Submission Reports**

All stage submission reports shall be submitted and be itemised under the National Standards Building Elements.

All required information shall be included in the report. Incomplete stage reports will not be accepted.

Where a Quantity Surveyor is employed as a member of the Design Team, he is responsible for determining and controlling the overall cost of the project. It is essential, therefore, that all reports emanating from the Building Services Building Services Consulting Engineer be routed through the Quantity Surveyor so that the overall cost implications for the project can be determined.

Full reconciliation of costs with previously approved stages must be provided.

### **18.4 Specifications**

All specification shall be submitted and itemised under the National Standards Building Elements for each nominated contract.

Each Specification shall include in the following order:

- Introduction detailing the project particulars.
- A general descriptive scope of works for each element.
- General contractual information
- A particular section relevant to the particular project in order to ensure clarity of the works and assist in competitive tendering. Equipment supplier's details and overview of equipment to be specified shall be included in these sections for each element.
- General specification detailing standard clauses and quality of workmanship etc.
- Equipment schedules in full

The specification shall only include services specific to the project and not be an all-encompassing generic style specification.

The section detailing the general contractual information shall include the following:

- Conditions of Contract including a schedule of clauses and details of any approved amendments to the standard clauses.
- Completed Appendix to the Conditions of Contract. This is of vital importance as it sets out the terms and conditions on which the tender offer is to be based (e.g.. insurance cover, rate of retention, terms for payment, main contract period, liquidated and ascertained damages).
- Any restrictions on site access, working hours, deliveries, car parking, traffic control, noise, access to existing buildings, etc. which would affect the sub-contractor's approach to the job.
- Location of site compound.
- Extent of the working area.
- Phasing or order of works requirements.
- Tax Clearance requirements.
- CIF Pension/Sick Pay Scheme membership requirements.

- Details of builder's work and attendances which will be provided to the sub-contractor.
- If the project comprises building services only and no general building contractor is to be appointed this shall be made clear in the tender documents and details given of the builder's work and attendances which the building services contractor will have to provide.

A summary of tender which, when completed by the tenderer, will as a minimum give a breakdown of the tender into elements, in accordance with the National Standard Building Elements and the sub elements used in the contents pages of this document. This shall be included at the end of the specification document together with a Form of Tender. For major equipment items such as boilers, radiators lighting, electrical and controls boards etc at least three alternative suppliers shall be named in the specification.

Where a Quantity Surveyor is employed as a member of the Design Team, the Building Services Consulting Engineer must liaise with the Quantity Surveyor in providing all of the above information so that both the main contractor and the building services sub-contractors are tendering on the same basis.

## **18.5 Drawings**

All drawings shall be submitted and itemised under the National Standards Building Elements for each nominated contract.

All standard drawings shall be of A1 size. Each drawing shall when folded into an A4 format include the following information on the front fold. Project Title, Drawing Title, Building Services Consulting Engineers Details, Scale, Quality Assurance Details including the School name and address. The drawings and drawing scales for each stage submission shall be as detailed in the Department's General Design Guidelines for Primary Schools.

## **18.6 Short-listing of Contractors for tendering**

There are strict guidelines that must be followed in order to comply with Public Procurement requirements for selection of contractors. There are two systems for contractor selection:

### **18.6.1 Restricted Tendering**

#### **(i) Pre-selection**

Where a selective tendering process is used, contractors are selected for tendering through submission of expressions of interest following public advertisement and placing a notice on the e-tender website ([e-tenders.gov.ie](http://e-tenders.gov.ie)) and, where relevant, in the EU Journal.

Applicants must provide information, which demonstrates compliance with the selection criteria as set out in the advertisement or in a follow-up questionnaire.

The Building Services Engineer must objectively assess the information provided in order to establish a list of suitable tenderers.

If the assessment process yields more than eight suitable contractors, a comprehensive marking scheme shall be objectively applied against the selection criteria and the top eight scorers selected for tendering.

The criteria, marking scheme and marks awarded shall all form part of the short-listing report.

**(ii) Selection from firms on a list**

Invitation for tenders from firms on a list is permissible so long as the Contracting Authority concerned is satisfied that the list is reasonably comprehensive, up to date and not discriminatory in nature.

If the number of firms on the list is too large to invite all suitable firms to tender, a number of firms shall be selected for inclusion in the competition. Selection from the list can be made randomly or by rotation, if firms on the list are of equal standing, but selection may also be based on factors such as overall suitability to the particular project – with due regard to the experience, organisation and financial standing – and fair distribution of opportunities. At least six firms, if possible, shall be invited to tender.

Each contract need not be separately advertised, but advertisements shall be placed in the national media, at least every 12 months, inviting firms to apply for inclusion on the list(s). Applications from firms that seek inclusion on a list shall be accepted at any time if they satisfy the necessary criteria laid down by the Contracting Authority. The procedures shall be reviewed on a regular basis.

The establishing and maintaining of a panel of contractors is generally only feasible where a Contracting Authority has a large number of buildings in its care and is engaged in a continuous programme of small scale projects of a similar nature over a prolonged period of years (e.g. maintenance work).

### **18.6.2 Open Tendering**

Contractors, on payment of a refundable deposit, apply for tender documents in response to an advertisement and submit a tender together with information on their financial and technical capacity including track record, experience of work of a similar size and nature, management capability, capacity, etc. All contractors meeting the minimum standards for participation (based on objective pre-determined criteria such as track record, experience, management capability, capacity, suitability to act as Project Supervisor Construction, etc.) and complying with the Tender requirements are deemed to have qualified and to have submitted valid tenders. The lowest valid tender shall normally be awarded the contract. In an open tendering situation the Building Services Engineer assesses the suitability of the contractor to carry out the work along with the evaluation of the tender itself.

While both systems are acceptable in publicly funded contracts, it is generally considered that pre-selection provides better opportunities for quality control of the finished building.

## 18.7 Tender Reports

All tender reports shall be submitted and be itemised under the National Standards Building Elements.

All tender reports shall include the following:

- Introduction with project details.
- Description of tender procedure used (e.g. open tendering, select list, EU procedures, etc.) and relevant dates.
- Statement as to whether tenders were sought on a fixed price or price fluctuation basis.
- Details of any additional information issued to tenderers during the tender period, stating dates, and confirmation that all tenderers have taken the additional information into account in their tenders.
- Details of approved budget costs for the projects including base dates.
- Details of returned documentation with discussion.
- Details of any qualifications to tenders and the method of dealing with them.
- Spreadsheet itemising all returned tenders in elemental format in accordance with the National Standard Building Elements.
- Confirmation of the status of the recommended tender with regard to price variation (i.e. is it fixed price or price fluctuation).
- Copy of the original summary of tender for the nominated contractors.
- Discussion on tenders received and reconciliation with the approved budget.
- Where the recommended tender is abnormally low, all questions of viability must be resolved directly with the sub-contractor before completion of the tender report and details included in the report.
- Where the recommended tender exceeds the approved budget, details of reductions to be made to achieve the budget must be included. Where a full Design Team is employed on the project, these reductions must be agreed by all members of the team before inclusion in the report.
- Details of Value Added Tax. This is particularly important for electrical sub-contracts where different rates of V.A.T. are likely to apply.
- Firm recommendation.

Where a Quantity Surveyor is employed as a member of the Design Team, the Building Services Consulting Engineer shall forward all tender reports for the building services sub-contracts to the Quantity Surveyor for inclusion in the overall tender report, i.e. only one overall tender report, which includes the main contract tender report and tender reports on all nominated sub-contracts, is acceptable.

It shall be noted that where tenders are sought on a fixed price basis and the lowest tender received includes a qualification with regard to fixed price, the first action is to request the tenderer to withdraw the qualification and to stand over the tender as a fixed price tender. If the tenderer refuses to withdraw the qualification the Building Unit shall be contacted for direction before proceeding further.

## **18.8 Variation/Cost/Progress Reports**

Cost/progress reports must be provided every 2 months, in accordance with the Design Team Procedures. Variations, which require approval, shall be detailed in the cost/progress report.

Where variations occur between the issue of cost/progress reports, which require Department approval and are too urgent to await the next cost/progress report, a separate report must be submitted to the Department through the Design Team leader and the Client.

Where a Quantity Surveyor is employed as a member of the Design Team, the Building Services Consulting Engineer shall forward all variation/cost reports for the building services sub-contracts to the Quantity Surveyor for inclusion in the overall variation/cost report, i.e. only one overall variation/cost report, which includes details of the cost implications on nominated sub-contracts and on the main contract, is acceptable.

Variations shall be categorised under the National Standard Building Element headings.

Each variation shall be described in detail and supported with drawings or sketches where necessary. The information required includes the following:

- Who requested the variation
- Why the variation is required
- Why the variation was not allowed for in the contract documents
- Full cost implications including main contractor's costs (if any)
- Recommendation on the value for money on offer in proceeding with the variation
- Details of how the additional cost is to be funded (e.g. through savings, through the Contingency Sum, directly by the Client, etc.).

## **18.9 Interim Valuations**

Where the Building Services Consulting Engineer is the sole Consultant with responsibility for costs, interim valuations for the services shall be completed to include all sections as detailed below.

Where a Quantity Surveyor is employed as a member of the Design Team, the Building Services Consulting Engineer shall forward interim valuations on the building services sub-contracts to the Quantity Surveyor for inclusion in the overall interim valuation.

All interim valuations shall include the following:

- Date of valuation
- Gross value of work completed in accordance with the contract
- Gross amount previously certified
- Balance now claimed
- Retention
- Value Added Tax calculations



Where the gross value of work being certified exceeds the approved contract sum, the Building Services Consulting Engineer shall ensure that funding for the excess has been arranged/approved before issuing the interim valuation

All valuations shall be dated and shall detail the relevant payments to date and payment due.

### **18.10 Final Account Reports**

Where the Building Services Consulting Engineer is the sole Consultant with responsibility for costs, the final account for the services shall be completed to include all sections as detailed below.

Where a Quantity Surveyor is employed as a member of the Design Team, the Building Services Consulting Engineer shall forward the final accounts for the Building Services sub-contracts to the Quantity Surveyor for inclusion in the overall final account, i.e. only one overall final account, which includes the main contract final account and final accounts for all nominated sub-contracts, is acceptable.

All final accounts shall include the following:

- Reconciliation with approved tender
- Details of all variations referenced against approvals
- Final adjustment of PC and Provisional Sums, if any
- Details of amounts claimed and verified under the price variation clause (if the contract was not fixed price) and the method of verification
- If the sub-contract has contributed to any delay or disruption claims or to the issue of an extension of time, details and justification must be provided.
- Final Value Added Tax calculations

All final account reports shall be submitted and be itemised under the National Standards Building Elements for each nominated contract.

### **18.11 Handover Documents**

The Building Services Consulting Engineer shall verify that all hand over documentation are completed to a satisfactory standard and are adequate.

Prior to demonstration users shall be provided, with an operating and maintenance manual, which clearly indicates in non-technical terms all aspects of operating the equipment and sets out the procedures for routine operation and maintenance checks and checklists. The manual shall include postal, telephone and email contact details for suppliers of replacement parts.

A laminated wall chart permanently fixed shall be provided explaining common operating / maintenance procedures and check lists for plant in the main plant rooms. All zones etc. shall be defined clearly in terms of actual classroom areas etc. and not just zone 1,2 etc. No abbreviations shall be used.

The Building Services Consulting Engineer shall create a schedule of all time clocks within the school detailing purpose and locations and agree with the Client the various operational times to be set on each clock.

Upon completion of the installations, a certificate in accordance with Appendix A shall be completed to verify that the system has been demonstrated to the users and that instruction manuals have been checked and issued to the School Principal. Each certificate shall be signed and dated by the School Principal and by the Building Services Consulting Engineers. This shall be submitted to the Building Unit as part of the Stage 9 Documentation.

On completion, the Building Services Consulting Engineers shall provide full test results in a bound paper form, and on a diskette. The contractors shall provide as constructed drawings in paper format and also AutoCAD 14 or latest addition format as detailed earlier.

### **19.0 Inspection, Testing and Commissioning**

In additions to regular site inspections of the installation of systems, when the installation of systems has been completed, the Building Services Consulting Engineer shall inspect the equipment in operation and advise the Contractor of any defects. All equipment and systems shall be demonstrated to the Building Services Consulting Engineer as working satisfactory and as designed.

Commissioning of installations shall be carried out in accordance with the procedures, checks and tolerances given in the relevant BSRIA Application Guides and achieve the standards set in the CIBSE Commissioning Codes and prevailing standards.

### **20.0 Training and Demonstration**

After the Building Services Consulting Engineer is satisfied and has witnessed that all equipment and systems are operating satisfactory, training and demonstration shall take place.

Adequate notice shall be given to the School Authorities and at an agreed time and in the presence of the Consulting Project Engineer, two training and demonstration events shall be provided.

The first training event shall take place on handover of the project and the second four weeks later.

### Appendix A Completion Record Sheet

<p><b>School Name:</b> <b>Address</b></p>		
<p><b>Project:</b></p>		
		<b>Signatures &amp; Date</b>
<p><i>Mechanical Services comprising heating, water services, ventilation, soils &amp; wastes, and fire protection services, Tested and Operating Satisfactorily</i></p>		
<p><i>Electrical Services comprising Electrical Supply, Electricity Centre, Main Distribution, Power Distribution, Earthing, Lighting Services, Communication Services, Transport Services and Protective Services Installed, Tested and Operating Satisfactorily</i></p>		
<p><i>Operating &amp; Maintenance Manuals handed over to School and explained</i></p>		
<p><i>Two training and demonstration meetings held in the presence of the Consulting Project Engineer and School Caretaker and Principal.</i></p>		<p><b>Date meeting 1:</b> <b>Date meeting 2:</b></p>
<p><i>Wall Chart provided, explaining common operating / maintenance procedures.</i></p>		
<p><i>As installed Drawings handed over to school in hard copy and on disc.</i></p>		
<p><i>School Principal Name:</i></p>	<p><i>Signed:</i></p>	<p><i>Date:</i></p>
<p><i>Building Services Consulting Engineers Name:</i></p>	<p><i>Signed:</i></p>	<p><i>Date:</i></p>