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Energy Conservation and Mechanical and Electrical Building Services Design Note 202001 July 2020

DESIGN UPDATES IN RELATION TO ENERGY CONSERVATION AND MECHANICAL AND ELECTRICAL BUILDING SERVICES IN PRIMARY AND POST-PRIMARY SCHOOLS

INTRODUCTION

This technical guidance design note is provided to either update or clarify existing Technical Guidance Documents (TGDs) information, or provide direction on a new provision not currently addressed in the TGDs or to confirm the functional requirements of identified items that have been in general practice for some time. This is to be read in conjunction with all other TGDs.

IMPLEMENTATION FOR SCHOOL PROJECTS:

SUMMER WORK PROJECTS:

For general implementation where relevant to the proposed works from November 2020 though can be implemented where relevant on site once there is no delay to project delivery, no significant redesign issues or change to the project cost. (Note: electric vehicle charging ducting is already provided for under full SWS electrical upgrade projects).

ADDITIONAL SCHOOL ACCOMMODATION PROJECTS:

For implementation where relevant to the proposed works, once there is no delay to project delivery, no significant redesign issues or change to the project cost.

NEW SCHOOL BUILDINGS, EXTENSION AND MAJOR REFURBISHMENT PROJECTS:

- **PROJECTS WHERE STAGE 1 IS IN PREPARATION:**
Apply below in full.
- **PROJECTS WHERE STAGE 2A IS IN PREPARATION:**
Where time allows and the implementation of these guidelines is not likely to contribute to delays in the preparation of Stage 2a documentation they should be incorporated into the stage submission. Where Stage 2a documentation is complete and ready for submission the guidelines should be implemented at Stage 2b.
- **PROJECTS WHERE STAGE 2B IS IN PREPARATION:**
Where time allows and the implementation of these guidelines is not likely to contribute to delays in the preparation of Stage 2b documentation this guidance should be incorporated into the stage submission. Where Stage 2b documentation is complete and ready for submission the guidelines should be implemented at Stage 3.
- **PROJECTS AT STAGE 3:**
The project should proceed without any amendments to tender documentation, the EVC requirements can be dealt with as a change order request post contract award.

The following design updates will be included in the next publication of the relevant Technical Guidance Documents:

1. Provision for installation of Electrical Vehicle Supply Equipment (EVSE) in schools

It is proposed to include for the new Electric Vehicle Charging (EVC) guidance in the 2nd Edition TGD 033 School Building Projects and Compliance with Part L of the Building Regulations 2017.

The TGD will include a section for school Boards of Management on what is involved in managing electric charging points and cost recovery, etc. The system provision will be based on EVC for school staff; it will be a matter for the school management to consider if they can facilitate public access to these chargers.

Publication of the final Part L and Building Regulations TGD L 2020 has been delayed due to the formation of the new Government. Implementation dates will be provided in these documents when published.

The design team shall identify an area within the car parking allocation which will facilitate electric vehicle charging for the provisions as established below. This area should be located as near as possible to the school building electrical switch room in order to minimise electrical power runs. It should be adjacent to a universal parking bay. The principal of design will be based on a local mini pillar at the car bays with localised wiring to future charging posts within a soft landscape area.

The design shall include;

- One number dual outlet charger located so that it can be used from a standard parking bay and from an accessible bay. An additional 1200 mm access zone is to be provided for universal parking bays.
- Ducting (only) locally from the mini pillar should be provided to cover a further 1 in 5 of the parking bays, to facilitate the future installation of additional charging posts as demand requires (ducting layout to be based on double charge posts). Note all provision for EVC to be located in the same area of the carpark to minimise installation costs and maximise supervision. Ducting to be terminated as outlined below.
- Each dual outlet charger post shall be of robust design and vandal resistant and be suitable for use in an unsupervised environment and feature the following;
 - i. The dual outlet charger and associated wiring, isolation and control devices shall be installed and wired in accordance with I.S. 10101: 2020.
 - ii. The dual outlet charger shall be capable of delivering 7 kW (32amp) single phase per outlet but internally configured to deliver at 3.6 kW.
 - iii. Be non-tethered and have Connector IEC 62196 Type 2 (Mennekes) with protection rating of IP65 or better.

- iv. Must be compatible with open charge point protocol (OCPP) as well as supporting a user identification system such as radio frequency identification (RFID) IEC14443 Type A 13.56 Mhz.
 - v. Shall have GSM Modem – GPRS or better.
 - vi. MID Power meter per outlet.
 - vii. Be part M compliant for accessibility.
 - viii. Include power overload and earth leakage protection per outlet.
 - ix. Be compatible to operate with a dynamic power load management system.
 - x. Be compliant with the prevailing **National Standards Authority of Ireland (NSAI)** National Rules for Electrical Installations, the International Electrotechnical Commission standards including 62196- Vehicle Connectors, 61851- Electric Vehicle Conductive Charging, 15118- Road Vehicles V2G, 14443- RFID and also the Open Charge Alliance (OCA) open standards including the Open Charge Point Protocol (OCPP) and the Open Smart Charging Protocol (OSCP) and the **Open Charge Point Interface** protocol (**OCPI**).
- In assessing the electrical maximum demand of the school the impact of EVC should be considered. The dynamic power load management system should ensure that the charging system will not cause exceedances of the agreed Maximum Import Capacity (MIC). This load management should eliminate the need to significantly increase the MIC as additional charge points are added in the future. The charge point equipment should be specified as a 7.2 kW but internally configured to deliver at 3.6 kW. This strategy will assist maintaining reduced running costs and can significantly reduce the requirement for additional import capacity.
 - The charge point management system should not form part of the contract and will be determined by the School with their own chosen operator when they commence operation.
 - An electrical underground red duct (internal diameter 125mm) shall be supplied and installed to ESB networks specifications complete with draw wire. This will route underground from the interior of the electrical switch room to the designated EV car park area terminating in an ESB approved junction box (JB 36) with compatible galvanised lid within the soft verge adjacent to the future charging bays. This will then enable fit out of a mini pillar and associated infrastructure to supply electrical vehicle charging stations.
 - The electrical distribution board in the electrical switch room should be designed with sufficient capacity and supply cables to facilitate the future installation of electric

vehicle charging as noted above within the same location. The cable feeding the charge point mini pillar should be sized with consideration for future expansion.

- The school CCTV system should be configured to provide coverage to the charging station area.

2. Radiator and radiant panel provision in schools

It has been general practice for some time that radiators in schools are low water content type, this note confirms this functional requirement for all new heating projects in schools.

3. Lighting controls and switches in schools

It has been general practice for some time to provide retractable switching in schools, this note confirms this functional requirement for all or all new lighting projects in schools.

Therefore clause 24.2 (k) in TGD 030 and in TGD 031 is revised to “ *All lighting installations operating in conjunction with automatic dimming to “Off” lighting controls and absence detection must have manual “On/Off/ dimming” switching arrangements via push type retractable light switches.*“

Given the advancement of interactive flat screens and their clear visual definition, there is no longer a requirement to have manual switching on the row of light fittings nearest the teaching wall, equally there is no longer a requirement to have two way switching of the classroom lights in the vicinity of the teachers desk. Therefore section 27.8 TGD 030 is withdrawn.

Automatic lighting controls in specialist rooms with high speed cutting machinery should be avoided.

4. Emergency assist alarms in schools

The provision for emergency assistance alarms has been revised (based on operational feedback and economics) to include pull chords switches only with suitable break strain provision; low level strip switches are not required.

Therefore clause 30.6 in TGD 030 and in clause 30.3 in TGD 031 is revised to “*Pull chord switches only shall be provided on emergency assistance alarm systems in Universal Access Toilets and Toilets/Showers for Assisted Users. Low level strip switches are not required.*”

This will be published in the next edition of TGD 002 and 003.

5. Fibre optic and ICT infrastructure cabling in schools

The Department’s Design Team Procedures require compliance with the prevailing design standards and performance so that all consultants ensure that they are operating to the latest design standards with regard to equipment and systems specifications.

This note relates to the provision of fibre optic cabling as noted in sections 6.9.1 and 6.9.2 respectively in the Guidance Document for the Provision of a Wireless Network Installation in Primary Schools (1st Edition January 2017) and Guidance Document for the Provision of Wireless Network Installations in Post Primary Schools (1st Edition May 2016).

Since publication of the Wireless Network Installation guidance the industry multimode fibre optic cable specification has moved from 62.5/125 to OM4 (50/125) Laser Optimised. Should a higher standard /performing cable become available in the market, this should be considered by the design team and raised at their next stage submission.

This note replaces in both documents '62.5/125' with 'OM4 (50/125) Laser Optimised' and removes the following text, as it's not needed, as the OM4 spec covers all details of the cables: '*Step index is not to be used. Cables shall be LSHF and water resistant. Cables shall be metal free.*'

- All elements of the structured cabling system shall be compliant to the relevant component specification of ISO 11801-1/ISEN 50173-1 for Cat6a U/UTP. All testing shall be carried with a Level III tester to EN 50173 PL2 (for a 2 connector Permanent Link) or PL 3 (for a 3 connector Permanent Link). Testing for POE should also be provided as part of the standards.
- All telecommunications cables, copper & fibre shall be compliant to the EU Construction Product Regulation (CPR) supported by a current Declaration of Performance. The cables shall meet, as a minimum, Cca s1a d1 a1 when tested to EN 13501-6.
- The Cat6a U/UTP Cca copper cable shall have a maximum Outside Diameter of 8.0mm so as to maximise space within the containment system.
- Offered solution should be sourced from a single manufacturer, with a complete Design and Manufactured System covered by a single 25 year Warranty Scheme encapsulating both Copper and Fibre. Distributor Brands will not be considered.
- Copper Connectivity must be third party tested to be compliant with all ISO/EN/TIA Component standards as well IEC 60512-99-002, test un mating under load.
 - IEEE 802.3at (Type 1) PoE up to 15.4 watts
 - IEEE 802.3at (Type 2) PoE+ up to 30 watts
 - IEEE Draft 802.3bt (Type 3) PoE+ up to 60 watts
 - IEEE Draft 802.3bt (Type 4) PoE+ up to 100 watts
 - Cisco Universal Power Over Ethernet (UPOE) up to 60 watts
 - Power over HDBaseTTM (POH) up to 100 watts
- Accredited to a recognised Environmental Improvement Scheme (Carbon Neutral) and ISO 14001 – Certificate.
- Test results will only be accepted with a manufacturer 25-year warranty for all Copper and Fibre optic products and labour for Cat6a U/UTP.
- The Department of Education and Skills will only accept handover of a project based on the manufacturer's warranty and certification otherwise the project will be deemed to be incomplete.

6. National Rules for Electrical Installations (Wiring Rules)

The NSAI published the 5th Edition National Rules for Electrical Installations, IS 10101:2020 on 6 March 2020. This replaced the 4th Edition, ET 101:2008.

The Commission for Regulation of Utilities (CRU) is the body responsible for regulating restricted and controlled electrical works in the Republic of Ireland. Through its designated

Safety Supervisory Body Safe Electric, the CRU ensures that electrical contractors comply with the current standard. As such, the CRU sets the transition period to IS 10101:2020.

The CRU had decided on a transition period of 24 months to enforce compliance with the new standard. However, transition deadline dates have been delayed by 4 months due to the Covid-19 pandemic. Therefore, the total transition timeline will be extended to 28 months. The following applies to all restricted and controlled electrical works in either commercial or domestic properties:

The transition period will begin from 1 April 2020. Electrical installations may be designed to the new standard from this date.

After ten months (from 1 February 2021), all new electrical installations must be designed and certified to the new standard.

After 28 months (from 1 August 2022), all electrical installations must be certified to the new standard.

Installations may be designed to the old standard until 31 January 2021, provided they are certified to at least a pre-connection stage by 31 July 2022.

Safe Electric will not process certificates for installations that are not in compliance with the transition timelines set out above.

It is the responsibility of the REC undertaking the works to ensure they certify to the correct standard and within the correct timeframe.

Where RECs submit certificates to the old standard after these deadlines, Safe Electric will not process the certificate and the REC will be required to bring the installation into compliance with the new standard – IS 10101:2020.

7. Drinking water service in schools

Drinking water services in primary and post primary schools should be designed in accordance with current prevalent Irish Standards, and to minimise system water volume and thereby stagnation time. Current guidance promotes using one loop terminating at the cold water storage tank. However this may result in a larger stored volume than other distribution layouts. Distribution layout should minimise total system volume. The design drawings should note the total system volume in litres. The need to make allowance for periodic flushing of the system should also be considered, particularly after Summer Holiday period, and manual flush valves included as necessary. O & M documentation should record any instructions on this matter.

In order to shorten dead legs in primary schools the classroom sink should be located adjacent to the corridor in the vicinity of the ensuite toilets to facilitate short final connections from the main distribution pipework which will be routing at high level in the ceiling of the adjacent corridor. As with current practice all sinks and wash hand basins should be located back to back where feasible for ease of servicing in a cost efficient manner.

8. Attached extensions to an existing school building with regard to fabric performance and renewables.

Section 2 TGD Part L 2017; *Buildings other than Dwellings* sets out guidance in relation to extensions in Par 2.1.1.1. This section gives guidance on acceptable levels of provision to ensure that heat loss through fabric elements, provided *by way of extension*, material alteration, or material change of use to an existing building, is limited insofar as is reasonably practicable.

Where a school is being extended by addition to the existing building, and is not a standalone extension, then the above guidance needs to be considered. The renewable aspects are also not a TGD Part L requirement when dealing with existing buildings, therefore photovoltaic provision for a connected extension to an existing school building should be developed only using the base electrical load (typically 2 kW for primary schools and 4kW for post primary schools) as the basis for PV design which is more appropriate in this case, as noted in section 4.8 TGD 033.

9. SBEM modelling requirements as noted in TGD 033.

Note that default factors and values should not be used in the SBEM modelling on school projects as these can result in a significant additional heat transfer and excessive final primary energy requirements.

Below are the key points to be aware of when creating compliance models for schools:

- **Thermal Bridging**

Use of default values will result in a significant additional heat transfer and excessive final primary energy requirements. Default thermal bridging factors should not be used in the SBEM modelling on school projects, the Project Architect must supply project appropriate thermal bridging factors for the project and SBEM analysis.

- **Lighting Efficiency**

Using the defaults for LED lighting will give a poor result. Efficiencies should be calculated for the proposed fittings and the actual value achieved entered. Note that lighting efficiency has improved over the last few years and is continuing to improve. As this input has a significant effect on the output it is important to check the fittings available at the time of tender and explicitly specify an appropriate efficiency.

- **Lighting occupancy sensing, and daylight sensing parasitic power**

If absence detection and daylight sensing is provided then it should be indicated in the inputs. The default parasitic power for lighting sensors will cancel out the benefits of lighting control in the calculation. A realistic figure should be used for detectors instead of the default. This should vary by room size based on the number of sensors used. (A lower figure will apply to larger rooms.)

- **Photovoltaic Panel Inputs**

It is important to enter the peak power values for panels rather than selecting the type of panel and area which will potentially apply out of date defaults. The software will default to a lower output per panel area than that readily achievable with modern panels. It is important to check available power densities at the time of tender as panel performance is improving gradually over time.

- **Metering Provision**

It is important that the metering provision option is set to “yes”. This will improve results by approximately 5%.

- **TGD033 Classroom Profile**

There is a specific classroom profile for Irish classrooms called “TGD033 Classroom”. Selecting “Classroom” instead will create a classroom with a UK profile which will have an increased energy usage.

- **Mechanical extract specific fan power**

Specific fan power should be entered with realistic values rather than defaults. In particular it is important to check the actual SFP of small fans used in primary school toilets as this can be notably lower than the default due to the low static pressure.

- **Pump Power**

There is a drop down for variable speed pumping. Selecting this option reduces electrical usage by 0.1 w/m².

- **Changing Areas**

Care is required with regard any space defined as a changing area, these get allocated with a large water usage even if they do not have showers. These need to be defined as an area with no water use when there are no showers present.

10. Design note in relation to CO₂ monitors in TGD 033 section 6.

Note that the minimum illuminated area of 25cm² is not required, a display of 8.5cm² which is currently being installed in schools is acceptable with the following indicator ranges;

Carbon Dioxide (CO₂) Traffic Light Display Indicator Ranges

Green	Amber	Red
<1000ppm	1000 to 1500ppm	>1500ppm

As the CO₂ monitor is 230V, a switched fused spur is required to isolate them. ETCI National Rules for Electrical Installations state that all 230V equipment must have a means of isolation.

11. Design note in relation to appendix 1: Airtightness test requirements and specification in Schools.

Please note that BS EN 13829:2001 ‘Determination of air permeability of buildings, fan pressurisation method’ have been replaced by IS EN ISO 9972 2017 and should be referenced instead.

12. Design note in relation to temperature sensors and digital thermostats.

Where the temperature sensors are 230V, a switched fused spur is required to isolate them. ETCI National Rules for Electrical Installations state that all 230V equipment must have a means of isolation.

13. Design note in relation to dado trunking on teaching wall.

If the teaching wall electronic device is an interactive smart screen and not a projector then the system should be Wi-Fi based and thus not require a network point at high level, therefore the provision at high level and associated power point should be omitted from the design and tender drawings. The design team shall also ensure dado trunking is to be provided so that no cabling is visible.

The design team shall also ensure that a sample teaching wall is mocked up by the contractor prior to full fit out to ensure full and detailed coordination of the services and that the school are aware of the teaching wall services provisions.

14. Design note in relation to projector audio faceplates (PAF).

Relating to Section 24.7 TGD 030, note that Video Graphics Array (VGA) sockets are no longer required in PAF in classrooms and should be replaced with an additional HDMI outlet. In the case of some of the new smart short throw projectors a USB connection between the low level and high level PAF will be required to enable the smart function on the projector.

15. Design note in relation to fire detection and alarm systems in schools

Fire Alarm Aspiration systems are required in lift shafts (I.S 3218). They should also be considered in double height spaces that have multiple smoke heads (>3), e.g. in Multi-Use Halls and General Purpose Spaces.

It is a statutory requirement that fire detection and alarm systems for buildings are to be serviced as required by I.S.3218:2013 +A1:2019. The servicing and maintenance of these life safety systems is the responsibility of the school management body.

To ensure servicing is carried out from handover, the Department requires that the first year of servicing of the fire alarm system is included within the scope of works in the tender package and that it is the responsibility of the Main Contractor to provide this service for the first year. After one year from practical handover the school board of management must exercise its responsibility to ensure a contract is in place for the servicing and maintenance of these life safety systems. This must be brought to the attention of the school at handover and again on expiration of the one year maintenance period by the Design Team.

16. Design note in relation to emergency lighting systems in schools.

It is a statutory requirement that emergency lighting systems are to be serviced as required by I.S. 3217:2013+A1:2017. The servicing and maintenance of these life safety systems is the responsibility of the school management body.

To ensure servicing is carried out from handover, the Department requires that the first year of servicing of the Emergency Lighting System is included within the scope of works in the tender package and that it is the responsibility of the Main Contractor to provide this service for the first year. After one year from practical handover the school board of management must exercise its responsibility to ensure a contract is in place for the servicing and maintenance of these life safety systems. This must be brought to the attention of the school at handover and again on expiration of the 1 year maintenance period by the Design Team.

17. Design note in relation to water services system design and sizing.

Note that gravity based cold water supplies is the preferred option with the cold water storage tank located within the roof space where technically and economically feasible. In schools where gravity cold water systems are not practically or economically viable due to pipe sizes, etc., pumped cold water systems may be required and can be considered. Where a cold water pumped system is provided the cold water storage tank need not be located in the roof space.

To facilitate WC flushing in the event of power outages, the day storage rainwater harvesting tanks shall be located in the roof space and maintain the rainwater distribution system to the fittings in the school as a gravity system in all schools.

Following review and analysis of water storage requirements in schools the following is proposed as the required basis for calculating storage volumes to meet a 24 hour (daily) school demand. Where further increases in school size might occur an allowance of 10% should be incorporated for storage volumes. In projects where no increase is possible no future allowance should be provided.

- Potable cold water supply 2.75 litres per pupil, for schools over 500 pupils with a ground floor tank with a 3 hour fill time this can be reduced to 2 litres per pupil.
- Shower suite if provided - add 500 litres.
- Rainwater harvesting for flushing high level storage tank:
 - Schools up to 500 pupils 8 litres per pupil.
 - Schools over 500 pupils 6 litres per pupil.

The use of loading units in pipe sizing calculations needs to be carefully considered, their direct application will result in oversized systems; careful implementation of the following flowrates should be included in the design development.

An acceptable maximum fill time for all roof mounted water storage tanks is 8 hours, this should be sufficient to refill tanks during school closed hours. The flowrates and pipe sizes for the cold feed to the tanks should be based on this criterion unless specific issues are identified on a local basis. Where a potable water tank is located at ground floor in the vicinity of the incoming mains water this can be set with a 3 hour fill time.

Flowrates for each of the various outlets and appliances shall be as follows in litres per second:

- Drinking water outlets 0.072 l/s (fills a 300ml cup in 4 seconds)
- Staff room & catering outlets 0.1 l/s.
- Blended supply to wash hand basins 0.033 l/s (cold water supply at 0.011 and hot water supply at 0.022 l/s).

Flow rates for non-potable supply to a WC cistern shall be based on a maximum fill time of 1 minute. For a 4 litre flush this equates to a flowrate of 0.067l/s.

<i>Water Storage Service</i>	<i>Volume</i>	<i>Fill Time</i>
Underground recovered rainwater tank	Up to 10,000 litres maximum	
High level recovered rainwater tank		
< 500 pupils	8 Litres / pupil	8 hours
> 500 pupils	6 Litres / pupil	8 hours
Potable water tank		
Stored at high level	2.75 Litres / pupil	8 hours
Stored at low level (pressurised system)	2.0 Litres / pupil	3 hours
If shower facility provided add	500 litres	

18. Design note in relation to alternative heating pipework in schools

Alternative heating pipework (as detailed in section 14.1 TGD 030) must not be deployed on vertical drops and at low level unless enclosed so as to provide adequate mechanical protection while ensuring the services are accessible.

For further advice on these or any other associated matters, please contact:

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