NBC & MSO

National Building Control & Market Surveillance Office

"Building Regulatory Compliance."

Level access to Buildings and Compliance with Parts A, C, D, H, L and M of the Building Regulations.

Date 6th April 2021

Building Control Act 1990-2014 (the Act) Compliance

Section 3(5) and Section 16 of the Building Control Act along with Article 9 of the Building Regulations are probably the most fundamental provisions in the entire statutory building control legislative framework. Essentially, all buildings to which the Building Regulations apply must, on foot of these provisions, be designed and constructed in accordance with the appropriate requirements of the Building Regulations. It follows that the primary responsibility for observing these requirements fall on the persons who are involved in the design[1] and construction[2] of works or a building and on the owners[3] of buildings, who normally start this process.

Building Control Act; Section 3(5) requires that "*Subject to subsection (11) and to—(a) any dispensation or relaxation granted under section 4 or 5, or (b) any appeal under section 7 which has been allowed, every building to which building regulations apply shall be designed and constructed in accordance with the provisions of such regulations.*"

Building Regulations; Article 9 Design and construction of works and buildings requires that:

(1) Every works or building to which these Regulations apply shall be designed and constructed—

(a) in accordance with the appropriate requirements set out in the Second Schedule, and

(b) in such a manner as to avoid the breaching of any other requirement of that Schedule.

(2) No works shall be carried out to a building which would cause a new or greater contravention in the building of any provision of these Regulations.

Furthermore, Section 16 of the Act states that "*Any person who contravenes (by act or omission) any requirement of this Act or of any order, regulation or notice under this Act shall be guilty of an offence*."

These provisions are supplemented by three important control mechanisms provided for in the Building Control Regulations in the form of Notices, Applications and Certificates of Compliance.

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[1] "***design***" *includes the preparation of plans, particulars, drawings, specifications, calculations and other expressions of purpose according to which the construction, extension, alteration, repair or renewal concerned is to be executed and "designed" shall be construed accordingly*".

[2] "***construction***" *includes the execution of works in connection with buildings and any act or operation necessary for or related to the construction, extension, alteration, repair or renewal of a building and "constructed" shall be construed accordingly*".

[3] **"Building Owner"** means the person who has commissioned or paid for the works and who has legal entitlement to have such works carried out on their behalf, and who submits a Commencement Notice or 7 Day Notice in accordance with the Building Control Regulations."

Building Regulations, the Requirements; Parts A, C, D, H, L & M

Part A Structures, A2 Ground movement; requires that "*A building shall be designed and constructed, with due regard to the theory and practice of structural engineering, so as to ensure that movements of the subsoil caused by subsidence, swelling, shrinkage or freezing will not impair the stability of any part of the building*."

Part C Site Preparation and Resistance to Moisture, C2 Subsoil Drainage and C4 Resistance to weather and ground moisture requires that "*Subsoil drainage shall be provided if necessary and the floors, walls and roof of a building shall be so designed and constructed as to prevent the passage of moisture to the inside of the building **or** damage to the fabric of the building*".

Part D Materials and Workmanship, D1 requires that, "*All works to which these Regulations apply shall be carried out with proper materials and in a workmanlike manner*." Furthermore, D3 defines "**proper materials**" as "*materials which are **fit for the use for which they are intended and for the conditions** in which they are to be used, and includes materials which:*

(a) bear a CE Marking in accordance with the provisions of the Construction Products Regulation,

(b) comply with an appropriate harmonised standard or European Technical Assessment in accordance with the provisions of the Construction Products Regulation; or

(c) *comply with an appropriate Irish Standard or Irish Agrément Certificate or with an alternative national technical specification of any State which is a contracting party to the Agreement on the European Economic Area, which provides in use an equivalent level of safety and suitability*".

Part H Drainage and waste water disposal, H1 requires that *"A building shall be provided with such a drainage system as may be necessary for the adequate disposal of surface water from the building."*

Part L Conservation of Fuel and Energy (Dwellings), L2 requires "*limiting heat loss and, where appropriate, maximising heat gain through the fabric of the building*".

Part M Access and Use, M1 requires that "*Adequate provision shall be made for people to access and use a building, its facilities and its environs*".

The **Technical Guidance Documents (TGDs)** which accompany each part of the Building Regulations give guidance on how the requirements of that part can be achieved in practice. Adherence to the approach as outlined in a Technical Guidance Document is regarded, as evidence of compliance with the requirements of the relevant part of the Building Regulations. The guidance as set out in the TGD Part C, D, L and M is outlined in **Appendix 1**[i].

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Compliance Challenges Noted for Buildings With Level Access

Parts A, C, D, H, M and Part L and Level Access

It is noted that for compliance with Part C1, the TGD C details that "*for an external wall, the damp-proof course should be at least 150 mm above the finished level of adjoining ground or paving*". This is a good design detail to prevent the passage of moisture to the inside of the building or damage to the fabric of the building. However, adherence to the detail in TGD C provides difficulty in compliance with the clear level area detail given in TGD M of "*at least 1200 mm wide and at least 1200 mm deep in front of every accessible entrance*".

Providing level access to comply with the requirements of Part M sometimes causes compliance challenges where designers and building control officers must look beyond the TGDs for compliance detail; to ensure that every works or building to which the Building Regulations apply shall be designed and constructed in accordance with the appropriate requirements set out in the Second Schedule, and in such a manner as to avoid the breaching of any other requirement of that Schedule.

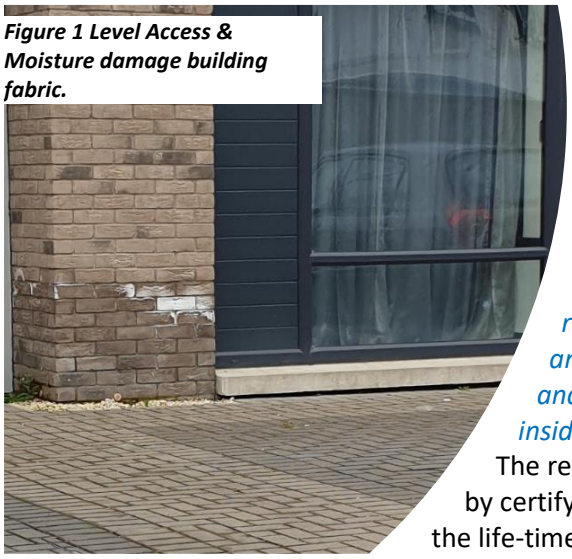

Figure 1 Level Access & Moisture damage building fabric.

Part C Site Preparation and Resistance to Moisture, C2 Subsoil Drainage and C4 Resistance to weather and ground moisture requires that "Subsoil drainage shall be provided if necessary and the floors, walls and roof of a building shall be so designed and constructed as to prevent the passage of moisture to the inside of the building or damage to the fabric of the building".

The requirement prescribes that compliance may be demonstrated by certifying that subject to ordinary maintenance, wear and tear for the life-time (50-60 years) of the works or building the design, materials and workmanship is such that:

- Moisture (water vapour and liquid water) is prevented from passing to the inside of the building,

or

- Damage to the fabric of the building is prevented.

It is also noted that TGD D in Section 1.2 refers to "*Resistance to Moisture*" and states that "*where any material is likely to be adversely affected by condensation, by moisture from the ground or by airborne moisture such as rain or snow: -*

(a) the construction should prevent the passage of moisture to the material, or

(b) the material should be treated or otherwise protected from moisture."

Publications referred to in TGD C include "*Accessible thresholds in new housing, Guidance for house builders and designers (1999) Department of the Environment, Transport and the Regions, The Stationery Office, The Publications Centre, PO Box 276, London SW8 5DT*[4]".

Further Guidance: GBG 47 Level external thresholds: reducing moisture penetration and thermal bridging.

Therefore, designers must specify compliance with Parts C and D in that materials to be used do not allow the passage of moisture to the inside of the building or that the materials specified in the design is such that damage to the fabric of the building is prevented. The design should include an assessment of the fitness for use and conditions in use of the material/ product. Consideration should be given to durability (Part A), safety, local climatic conditions (e.g. wind driven rain, water table, exposure, topography, soil type, humidity etc.) and other such issues including construction testing and handover maintenance requirements . Furthermore, designers must ensure that appropriate subsoil drainage is designed in compliance with Part H to facilitate this; and heat loss form the building (Part L) is mitigated.

[4] The aim of this guide is to suggest design solutions that will make the thresholds of dwellings more accessible to wheelchair users and people with limited mobility, whilst minimising the risk of water entering the building, and to help designers achieve solutions that do not conflict with other aspects of the Building Regulations.

It is noted from inspections that many developments have provided detailed and innovative designs taking account of the above requirements and considerations; but have omitted testing to show that workmanship is appropriate.

Figure 2 Moisture adsorption/passage to brickwork, drainage not doing its job to dispose surface water from the building- -French Drain-stone!!

Another issue observed from inspection is competency in construction; to ensure a proper standard of workmanship. It is essential that persons are competent, possessing sufficient training, experience and knowledge appropriate to the nature of the work he or she is required to perform and having particular regard to the size and complexity of such works**.**

An understanding of how the building and its ancillary services will perform in use over time is important as non-fulfilment of an intended requirement of the Building Regulations may not manifest for some time.

Part C and Part H the Passage of Moisture and Drainage

Permeable Paving is an important sustainable drainage (SUDS) technique which allows water to pass through joint filling material in gaps between paving blocks or flags into the underlying permeable sub-base. It is very important to ensure that these systems are appropriately designed, prescribing materials which are fit for use in specified conditions. Certification and testing should be available to ensure that the system is adequate and appropriate to comply with the requirements of C2 "*Subsoil drainage shall be provided if necessary so as to prevent the passage of ground moisture to the interior of the building or damage to the fabric of the building*" and H1 Drainage System "*A building shall be provided with such a drainage system as may be necessary for the adequate disposal of surface water from the building*".

Figure 3 Moisture adsorption/passage-permeable paving not successful in disposing surface water from the building. Note also grass area!

Design criteria should be available to demonstrate that the urban drainage system allows heavy rain, roof water and water from other impermeable areas ancillary to the building to infiltrate through a permeable paved surface into a designed sub-base before being released in a controlled manner into sewers or water courses. The design criteria should include how fit for use is to be demonstrated through certification, testing etc.

Figure 4 Moisture adsorption/passage-Level access, sills at ground level permeable paving-and considerable slope!!

Design criteria should be available to demonstrate that the time of concentration and discharge rates are adequate and appropriate to prevent flooding, ponding or build-up of moisture around buildings. Design criteria should include subject to ordinary maintenance, wear and tear that the permeable paving is fit for use which should include a detailed testing and maintenance schedule with as constructed details and tests.

Part C and H and Window Sills at Ground Level

Another issue of note is that **Window Sills located at ground level** require detailed design to ensure that moisture is prevented from passing to the inside of the building i.e. Part C and Part H detailed design.

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Summary

Buildings designed for level access, window-sills at ground level and the use of permeable SUDS paving systems must demonstrate compliance with Part A, C, D, H, L and M, noting compliance with one requirement must not cause a breach of another requirement of the building regulations.
If moisture is not effectively drained from the building or materials used in the fabric are not fit for use, then the risk of moisture access to or heat loss from the building or damage to the building fabric is high.

In any event it is good practice to double check the durability of the blocks, bricks or other materials used below ground level, as remediation of defects will be very difficult and often the damage or defect will not manifest for some time when damage or failure of the fabric will be very visible and affecting the health, safety and welfare of people in or about the building. "*S.R. 325:2013+A2:2018 - Recommendations for the design of masonry structures in Ireland to Eurocode 6*" gives good guidance on durability of block and Brick work in exposed areas-ref. extract below[ii].

Building Control Officers under their powers to issue Section 11 requests to "*require the owner or occupier of the building, or any person responsible for the construction of the building, to provide such plans, documents and information as are necessary to establish whether the requirements of building regulations are being complied with in relation to the building*".

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Section 11 request to establish Compliance with the following parts of the Building Regulations:

***A2 Loading**: Provide to the Building Control Authority such plans, documents and information as are necessary to establish whether the requirements Part A2 is being complied with in relation to the Building/s (1…n). In particular submit site investigation reports and appropriate drawings to describe how the building/s has/have been designed to ensure movements of the sub-soil will not impair the stability of any part of the building.*

C2 Subsoil Drainage and C4 Resistance to weather and ground moisture: Provide to the Building Control Authority such plans, documents and information as are necessary to establish whether the requirements Parts C2 and C4 are being complied with in relation to the Building/s (1…n). In particular describe with construction details what measures are being taken to prevent the ingress of ground moisture to the building/s **or** damage to the fabric of the building/s. Describe also what precautions are being taken to avoid danger to health and safety caused by substances found on or in the ground to be covered by the building/s.

D1 Materials and Workmanship and D3 Proper Materials: Provide to the Building Control Authority such plans, documents and information as are necessary to establish whether the requirements Parts D1 and D3 are being complied with in relation to the Building/s (1…n). In particular describe with certification details (e.g. CE marking, ETA, Agrément or independent certification, tests and calculations, performance in use, ancillary certification or other appropriate demonstration of compliance) of the materials to be used in the construction of the permeable paving; radon barrier, damp proof membrane, cavity insulation products, brick/blockwork to be used below and above ground level, ACO drain system, window sill, flashing etc).

Provide details of what measures are being taken to ensure these works are carried out with proper materials and in a workmanlike manner.

H1 Drainage and Waste Water Disposal: Provide to the Building Control Authority such plans, documents and information as are necessary to establish whether the requirements Part H1 are being complied with in relation to the Building/s (1…n). In particular provide details of the drainage system provided for the adequate disposal of surface water from the building/s, to include permeable paving design, testing and certification.

L2 Conservation of Fuel and Energy (Dwellings), Provide to the Building Control Authority such plans, documents and information as are necessary to establish whether the requirements Part L2 are being complied with in relation to the Building/s (1…n). In particular provide details of the measures to limit heat loss and, where appropriate, maximise heat gain through the fabric of the building and the measures to ensure continuity of insulation and to limit local thermal bridging at key junctions, e.g. around windows, doors, other wall openings and at junctions between elements.

M1 Access and Use, Provide to the Building Control Authority such plans, documents and information as are necessary to establish whether the requirements of Part M1 are being complied with in relation to the Building/s (1…n). Show how adequate provision for people to access and use the building/s, its/their facilities and its/their environs including details of how level access is provided having regard to the requirements of the Building Regulations generally, particularly in relation to resistance to weather and ground moisture.

Please submit the required information within 14 days of the date of this letter and in any case no later than [ ]. The information may be submitted via the BCMS by uploading additional supporting documentation or alternatively you can submit it direct to this office and preferably in electronic format. The writer must be informed directly when the information has been submitted.

Yours faithfully,
Building Control Officer

In essence Designers should consider the following:

Part C Site Preparation and Resistance to Moisture:

(a) How design minimises the risk of water ingress or damp entering the building
(b) How design provides adequate sub-floor ventilation **(*Suspended floors only*)**
(c) How design prevents Radon Gas entering the building **(Especially a high radon area)**

Part D Materials and Workmanship

(d) How Design provides of durable solutions, taking account of workmanship requirements & products/materials used **(TGD D)**

Part L Conservation of Fuel and Energy

(e) How design limits thermal bridging (TGD L)(Reference to Appendix D)

Part M Access and Use

(f) How design provides Access to Dwellings **(TGD M) (For main entrance only)**

Other -durability, health, safety and welfare

(g) Will the Product fail (i.e. the Brick to a point that would result in a Health, Safety and Welfare Risk (Structural failure)?
(h) Is there a possibility of radon getting into the building? (how is radon prevented from getting into the wall cavity.)
(i) Does the design consider durability and maintenance issues in relation to the building? (Drainage channels, permeable paving, filter drains, render systems etc)
(j) Is the design fit for use?
(k) Has a risk-assessment for compliance with Part A-M for the building as a whole, product/material fit for purpose in the conditions it is to be used been carried out?
(l) Etc depending on complexity….

"Good" Example C4 non-compliance for walls is the MICA in Donegal.

- **The render on the blockwork allowed the passage of moisture (wind driven rain) into the blockwork.** (failed to prevent the passage of moisture)
- **The Blockwork failed due to water/moisture reacting with the MICA leading to damage to the fabric of the Building.** (failed to prevent damage to the fabric of the building)
- Since the Mica issue SR 325 was amended to add ANNEX F in 2018 version for renders systems.

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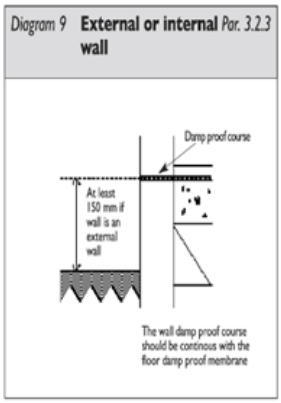
[i]

Appendix 1 –
Building Regulatory Compliance
Access to a Building
TGD Guidance Parts C, D, L, M

Noting –Part C, Site Preparation and Resistance requires that for an external wall, the damp-proof course should be at least 150 mm above the finished level of adjoining ground or paving as in Diagram 9



The Requirements (In Blue)-quoted directly from the TGDs.

Part C -Site Preparation and Resistance to Moisture, TGD Guidance

"C4 The floors, walls and roof of a building shall be so designed and constructed as to prevent the passage of moisture to the inside of the building or damage to the fabric of the building.

Ground Supported Floors

External and Internal Walls Moisture from the Ground

3.2.3 *The following paragraphs give some guidance on good practice insofar as it relates to non-complex buildings of normal design and construction.*

(a) *Walls should have a damp-proof course of bituminous material, engineering bricks or slates set in cement mortar or any other material that will prevent the passage of moisture. The damp-proof course should be continuous with the damp-proof membrane in the floors.*

(b) *If the wall is an external wall, the damp-proof course should be at least 150 mm above the finished level of adjoining ground or paving (see Diagram 9).*

(c) *If the wall is an external cavity wall, the cavity should be taken down at least 150 mm below the level of the lowest damp-proof course or a damp-proof tray should be provided so as to prevent rain or snow passing to the inner leaf.*

3.2.4 BS8102 :1990 *gives methods of preventing entry of ground and surface water into buildings from surrounding areas.* ***BS 8215 : 1991*** *contains in clauses 4 and 5 recommendations for the selection, design and installation of damp proof courses in both solid and cavity masonry construction."*

Part D - Materials and Workmanship, TGD Guidance

"D1 Materials and Workmanship, requires that, "All works to which these Regulations apply shall be carried out with proper materials and in a workmanlike manner." Furthermore, D3 defines "proper materials" as "materials which are fit for the use for which they are intended and for the conditions in which they are to be used, and includes materials which:

(a) bear a CE Marking in accordance with the provisions of the Construction Products Regulation,

(b) comply with an appropriate harmonised standard or European Technical Assessment in accordance with the provisions of the Construction Products Regulation; or

(c) comply with an appropriate Irish Standard or Irish Agrément Certificate or with an alternative national technical specification of any State which is a contracting party to the Agreement on the European Economic Area, which provides in use an equivalent level of safety and suitability".

Section1 Materials -Fitness of Materials

1.1 *Requirement D3 defines what is meant by "proper materials" for use in works. In assessing the fitness for use and conditions of use of a material/ product, consideration should be given to durability, safety, local climatic conditions (e.g. wind driven rain, humidity etc.) and other such issues.*

While the primary route for establishing the fitness of a material for its intended use is through the recognised standardisation procedures referred to in paragraphs (a), (b) or (c) of Requirement D3, other methods may also be considered in establishing fitness including: -

*(a) **Independent certification schemes by approved bodies** e.g. the National Standards Authority of Ireland (NSAI). Such certification schemes may provide information on the performance of a product or certify that the material complies with the requirements of a recognised document and indicates it is suitable for its intended purpose and use. Accreditation of the body, by a member of the European cooperation for Accreditation (EA) such as the Irish National Accreditation Board (INAB), offers a way of ensuring that such certification can be relied on. All such certification schemes may be in addition to, but not conflict with, CE marking;*

***(**b) **Tests and calculations carried out by an accredited laboratory**, showing that the material is capable of performing the function for which it is intended. Accreditation by a member of the European cooperation for Accreditation (EA) such as the Irish National Accreditation Board (INAB) offers a way of ensuring that tests are conducted in accordance with recognised criteria and can be relied on;*

*(c) **Performance in use**, i.e. that the material can be shown by experience, such as its use in a substantially similar way in an existing building, to be capable of enabling the building to satisfy the relevant functional requirements of the Building Regulations.*

***Note**: Schemes which comply with the relevant recommendations of I.S. EN ISO 9001: 2008 Quality management systems are intended to ensure that materials can be expected to be of consistent quality. They are not intended to show that the materials conform to an appropriate technical specification.*

Resistance to Moisture

1.2 Where any material is likely to be adversely affected by condensation, by moisture from the ground or by airborne moisture such as rain or snow: -

(a) the construction should prevent the passage of moisture to the material, or

(b) the material should be treated or otherwise protected from moisture.

See also Technical Guidance Document C – Site Preparation and Resistance to Moisture.

Section 2 Workmanship -Adequacy of Workmanship

***2.1** A proper standard of workmanship and the appropriate use of any material is essential to achieving compliance with the requirements of the Regulations.*

***2.3** If other methods are being used, it may be possible to demonstrate that the workmanship satisfies the relevant requirement by: -*

***(a)** quality assurance schemes, i.e. the method is covered by a scheme which complies with the relevant recommendations of I.S. EN ISO 9001: 2008 Quality management systems; or*

***(b)** performance in use i.e. by showing, such as in an existing building, a previous use of the method of workmanship is capable of performing the function for which it is intended.*

***2.5** To ensure a proper standard of workmanship, it is essential that persons are competent, possessing sufficient training, experience and knowledge appropriate to the nature of the work he or she is required to perform and having particular regard to the size and complexity of such works.*

Resistance to Moisture

1.2 Where any material is likely to be adversely affected by condensation, by moisture from the ground or by airborne moisture such as rain or snow: - (a) the construction should prevent the passage of moisture to the material, or (b) the material should be treated or otherwise protected from moisture."

Part L - Conservation of Fuel and Energy – Dwellings, TGD Guidance

"L2 For existing dwellings, the requirements of L1 shall be met by:

(a) limiting heat loss and, where appropriate, availing of heat gain through the fabric of the building;

(b) controlling, as appropriate, the output of the space heating and hot water systems;

(c) limiting the heat loss from pipes, ducts and vessels used for the transport or storage of heated water or air;
(d) providing that all oil and gas fired boilers installed as replacements in existing dwellings shall meet a minimum seasonal efficiency of 90 % where practicable.
L6 Energy performance of buildings requirements as set out in the European Union (Energy Performance of Buildings) Regulations 2019
1.3.3 Thermal bridging
1.3.3.1 *To avoid excessive heat losses and local condensation problems, reasonable care should be taken to ensure continuity of insulation and to limit local thermal bridging at key junctions, e.g. around windows, doors, other wall openings and at junctions between elements. Any thermal bridge should not pose a risk of surface or interstitial condensation.* ***Appendix D.2*** *provides further information on assessing surface condensation risk and* ***Appendix B.3*** *provides information on assessing interstitial condensation risk.*
Heat loss associated with thermal bridges is taken into account in calculating energy use and CO2 emissions using the DEAP methodology. See ***Appendix D*** *for further information in relation to thermal bridging and its effect on dwelling heat loss and how this is taken account of in DEAP calculations.*
1.3.3.2 *The following represents alternative approaches to making reasonable provision with regard to limitation of thermal bridging:*
(i) *adopt Acceptable Construction Details for typical constructions as shown in sections 1 to 6 in the document "****Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"*** *for all key junctions;*
(ii) *adopt Acceptable Construction Details sections 1 to 6 combined with details from Appendix 2 of the document "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details" or other certified details (as defined in (iii) below) for all key junctions;*
(iii) *use certified details which have been assessed in accordance, and comply with Appendix D, e.g. certified by a third party certification body such as Agrément or equivalent or certified by a member of an approved thermal modelers scheme or equivalent for all key junctions;*
(iv) *use alternative details which limit the risk of mould growth and surface condensation to an acceptable level as set out in paragraph* ***D.2 of Appendix D*** *for all junctions.*
*Irrespective of which approach is used, appropriate provision for on-site inspection and related quality control procedures should be made (****see sub-sections 1.5.2 and 1.5.3)".***

Part M-Access and Use (2010), TGD Guidance
"M1 Adequate provision shall be made for people to access and use a building, its facilities and its environs.
Section 3.2 Access to Dwellings
3.2.2 Accessible entrance
The main entrance is the entrance, which a visitor not familiar with the dwelling would normally expect to approach.
Where an accessible entrance is provided:
(a) *there should be a clear level area at least* ***1200 mm*** *wide and at least* ***1200 mm*** *deep in front of every accessible entrance. Where a level entry is provided, regard should be had to the requirements of the Building Regulations generally, particularly in relation to* ***resistance to weather and ground moisture****. Guidance on the issues involved in the provision of level entry can be found in the publication '****Accessible thresholds in new housing'****;"*

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[ii] *'S.R. 325:2013+A2:2018 - Recommendations for the design of masonry structures in Ireland to Eurocode 6' gives good guidance on durability of block and Brick work in exposed areas.*

5.6 Durability

5.6.1 General

5.6.1.1 Features influencing durability A major factor influencing the durability of masonry and any applied finishes is the degree to which the construction may become saturated with water. It may become saturated directly by rainfall, indirectly by water moving upwards from the ground or laterally from retained material as in a retaining wall.

External masonry is much less likely to become saturated where projecting features have been provided to shed run-off' water clear of the walling. Examples of such features are;

a) protection to wall heads by roof overhangs or copings,
b) projecting throated sills,
c) bell casting to rendering and similar features at the base of tile hanging and other impermeable cladding. It should be noted that conventional weathering details may not protect walls sufficiently in situations of Severe or Very Severe exposure as classified in 5.5.2. Recessing of the joints may increase water intake and application of an initially impervious finish, e.g. of masonry paint, tiling, or a dense rendering may lead to entrapment of moisture if imperfections develop or if water is able to get behind the finish by any path.
External masonry will generally be maintained in a drier condition by a moderately porous uncracked rendering complying with I.S. EN 13914-1 or by a ventilated cladding such as slate or tile hanging, by weather-boarding, and by panels of various materials, e.g. of plastics, timber or metal.

5.6.1.2 Frost

Frost may damage both masonry units and mortar, depending upon their susceptibility to such damage on freezing in the saturated condition. Masonry is particularly at risk when construction takes place during the winter. Masonry units in stacks and uncompleted masonry may become saturated unless adequate protection is provided (see 6.6). In addition, when fired-clay brick masonry remains wet for long periods of time and soluble sulphates are present in sufficient quantities in the bricks, sulphate attack on the mortar joints and other materials containing Portland cement may arise (see 5.6.2).

5.6.1.3 Masonry construction

The durability of masonry depends primarily upon the characteristics of the masonry units and the mortar, particularly as regards resistance to frost and to chemical attack. The following factors affect the susceptibility of the masonry to damage;

a) exposure to the weather or to other sources of water (see 5.6.1.4),
b) exposure to aggressive conditions from all sources including the ground (see 5.6.1.5 and 5.6.2), c) the adequacy of methods taken to prevent the masonry from becoming saturated both in terms of design (see 5.6.3) and workmanship. Particular attention should be paid to the choice of masonry units and mortar in the following and similar situations where the masonry is likely to become, and may remain, saturated for long periods of time:

1) in chimney terminals, sills, copings and cappings,
2) in freestanding and retaining walls, parapets and chimney stacks,
3) below DPC at or near ground level and in foundations, manholes and inspection chambers,
4) below large expanses of glazing or impermeable cladding. The degree to which masonry used below DPC at or near ground level becomes saturated will vary according to the site.

The masonry materials will be far less prone to problems on a site that is well drained and dry. Where a site is wet, and/or the masonry at or near ground level may be subject to saturation, particular care should be taken in the choice of materials. It is good practice to ensure that concrete and paved surrounds do not direct water into the masonry. Where there is more than 150 mm of masonry exposed between DPC and finished ground level, e.g. on sloping sites, the inner leaf of such masonry may act as an earth-retaining wall. As a result, considerable quantities of water may be transferred into the walling. There is thus an increased risk of frost and sulphate attack, efflorescence, lime leaching and staining of the outer leaf. The application of a waterproofing treatment to the face of the masonry in contact with the ground will minimize or obviate such problems."

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