

Common issues with domestic extensions

A recipe for success

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Back to Basics

An overview of some common issues relating to simple domestic extensions that can lead to significant compliance problems

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How is Building work assessed

Enforcing Legislation

Building Act 1984

Statutory Instrument

Building Regulations
2010 set the technical
standards/objectives

GUIDANCE

Approved
Documents

Building Bulletins,
British/EN
Standards

Supplementary
Guidance



The Building Regulations

Responsibility?



Manual to the Building Regulations

A code of practice for use in England



Responsibility for compliance

Receiving a completion certificate or final certificate is not a complete guarantee of compliance with the Building Regulations. The legal meaning of the certificate is that it is 'evidence but not conclusive evidence' of compliance. The building control officer or approved inspector will not have checked every piece of building material and how it has been fitted or every aspect of submitted documents. It is the responsibility of those carrying out building work to comply with the Building Regulations. The building control body will inspect the work on site at appropriate stages, but you cannot rely on this as the only method of ensuring that the work complies with the Building Regulations. The responsibility for ensuring compliance rests with the people carrying out the work.

For example, a building has just received the final certificate or completion certificate, but the roof is leaking. The fact that the roof leaks is the builder's or building designer's problem and not the building control body's problem. However, the building control body may point out problems either with the design or construction at any stage up to granting the final certificate or completion certificate.

Appropriate – Reasonable – Adequate – Suitable

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Don't forget ...



Department for
Communities and
Local Government

Party Wall etc. Act 1996
Explanatory Booklet

May 2011
Department for Communities and Local Government



A clear, impartial guide to
Party walls



In association with  rics.org/consumerguide



Health and Safety
Executive

**Managing health and safety
in construction**

Construction (Design and Management) Regulations 2015

Guidance on Regulations



L163
Published 2015

The Construction (Design and Management) Regulations 2015 (CDM 2015) came into force on 6 April 2015, replacing CDM 2007. This publication provides guidance on the legal requirements for CDM 2015 and is available to help anyone with duties under the Regulations. It describes:

- the law that applies to the whole construction process on all construction projects, from concept to completion; and
- what each dutyholder must or should do to comply with the law to ensure projects are carried out in a way that secures health and safety.

HSE Books

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ISO9001 Certified



Back to Basics

1. Foundations
2. Drainage
3. DPC arrangements
4. Thermal Insulation
5. Roof ventilation

Foundation solutions Strip/trench fill

Cure?



Example of local failure



1. Foundations

Alternative foundation design solutions

Ground conditions and contaminants

Clay subsoils and the potential effect of trees

Existing sewers and the requirements of the
Water Authority



1. Foundations



Potential hazard	Associated risk
High water table or low-lying land	<ul style="list-style-type: none">■ flooding■ the effects from toxic or noxious materials which could be concentrated or transported by ground water.
Mining (past, present and proposed)	<ul style="list-style-type: none">■ ground movement as a result of the type of mining and materials extracted■ ground gasses, including methane and carbon dioxide.
Trees	<ul style="list-style-type: none">■ shrinkage and heave of clay soils■ physical damage caused by roots.
Peat	<ul style="list-style-type: none">■ acid attack■ changes in volume due to variations in moisture content■ production of methane and carbon dioxide.
Infill and made ground, including tipping	<ul style="list-style-type: none">■ release of gases which may be explosive or asphyxiating■ low bearing capacity causing excessive total and/or differential settlements■ consolidation characteristics which may result in subsidence, settlement and/or excessive tilt■ localised ground variability (laterally and with depth) which may result in subsidence, settlement and/or excessive tilt■ collapse compression or inundation settlement of non-cohesive fills which may result in subsidence, settlement and/or excessive tilt.
Low bearing capacity ground	<ul style="list-style-type: none">■ settlement of foundations and substructures.
Former buildings or structures	<ul style="list-style-type: none">■ underground obstructions producing variations in bearing capacity and settlement characteristics.
Adjacent buildings	<ul style="list-style-type: none">■ effect on stability of both new and existing buildings.
Drains, including land drains	<ul style="list-style-type: none">■ contamination, flooding, waterlogging and interruption of land drainage systems.
Sulfates in ground or ground water	<ul style="list-style-type: none">■ expansive reaction■ chemical attack on concrete, mortar and bricks or blocks made with cement.
Contamination	<ul style="list-style-type: none">■ from substances which may be carcinogenic, toxic, asphyxiating, corrosive, phytotoxic, combustible, explosive or radioactive.
Solution features in chalk and limestone, including swallow holes	<ul style="list-style-type: none">■ underground cavities.
Unstable ground subject to landslip	<ul style="list-style-type: none">■ ground movement.
Seas, lakes and rivers adjacent to land	<ul style="list-style-type: none">■ erosion.

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Foundation solutions

Strip/trench fill

Piles

Pier and beam

Raft



Foundation solutions Strip/trench fill

How deep?

How wide?

Concrete mix?

Foundation solutions Strip/trench fill



Minimum depth of strip foundations

2E4 Except where strip foundations are founded on rock, the strip foundations should have a minimum depth of 0.45m to their underside to avoid the action of frost. This depth, however, will commonly need to be increased in areas subject to long periods of frost or in order to transfer the loading onto satisfactory ground.

Foundation solutions Strip/trench fill



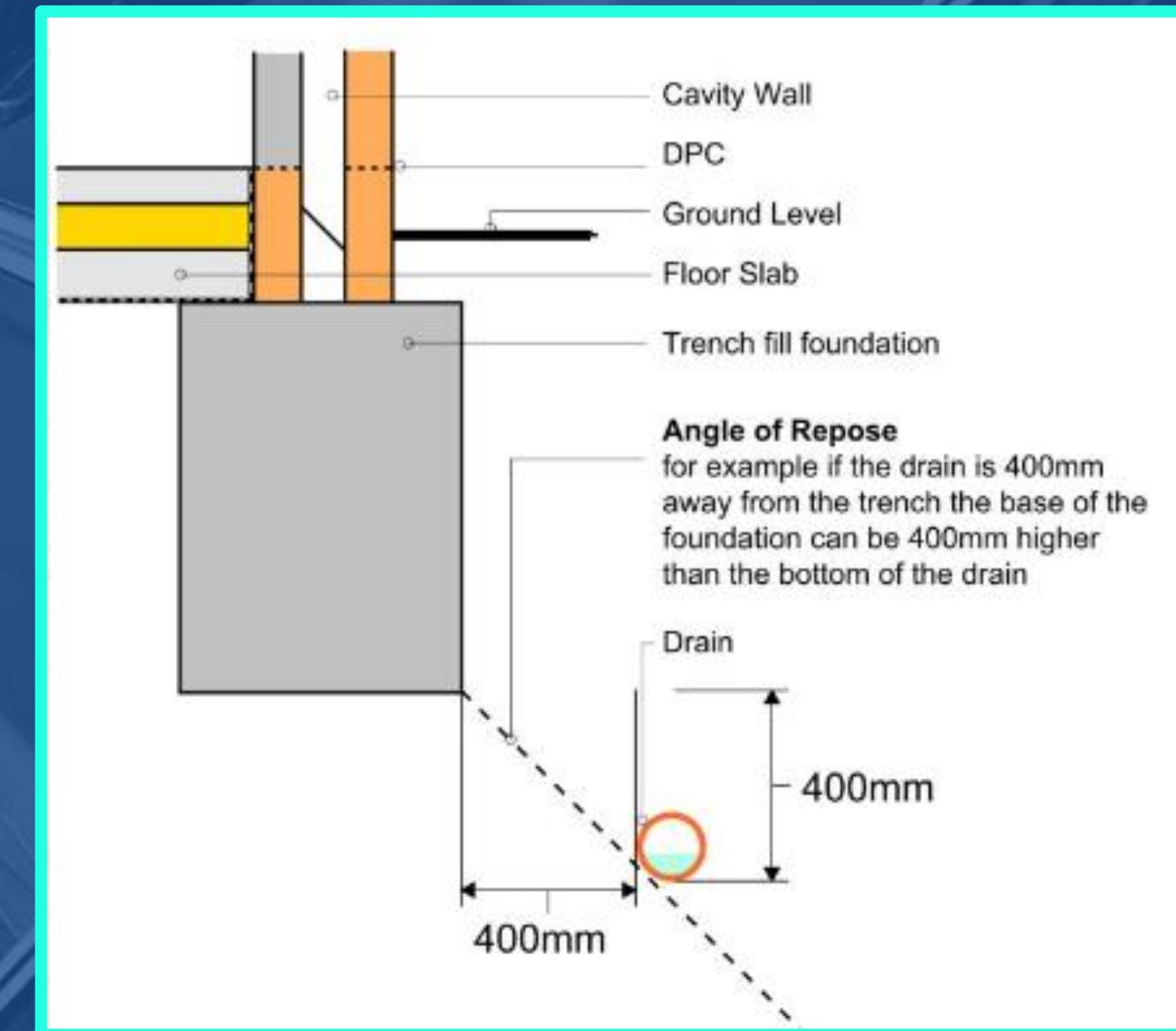
In clay soils subject to volume change on drying ('shrinkable clays', with Modified Plasticity Index greater than or equal to 10%), strip foundations should be taken to a depth where anticipated ground movements will not impair the stability of any part of the building taking due consideration of the influence of vegetation and trees on the ground. The depth to the underside of foundations on clay soils should not be less than 0.75m on low shrinkage clay soils, 0.9m on medium shrinkage clay soils and 1.0m on high shrinkage clay soils, although these depths may need to be increased in order to transfer the loading onto satisfactory ground, or where there are trees nearby.

Foundation solutions Strip/trench fill

How deep?

Foundations to be taken down to the invert of adjacent existing sewers having regard to the 'angle of repose' subject to ground conditions*

*Trees in clay subsoil to be discussed further



Foundation solutions Strip/trench fill

How wide?

Width will depend on the soil type as defined in Table 10 of Approved Document A

Typically 600mm for a 300mm cavity wall



Table 10 Minimum width of strip footings

Type of ground (including engineered fill)	Condition of ground	Field test applicable	Total load of load-bearing walling not more than (kN/linear metre)					
			20	30	40	50	60	70
			Minimum width of strip foundations (mm)					
I Rock	Not inferior to sandstone, limestone or firm chalk	Requires at least a pneumatic or other mechanically operated pick for excavation	In each case equal to the width of wall					
II Gravel or sand	Medium dense	Requires pick for excavation. Wooden peg 50mm square in cross section hard to drive beyond 150mm	250	300	400	500	600	650
III Clay Sandy clay	Stiff Stiff	Can be indented slightly by thumb	250	300	400	500	600	650
IV Clay Sandy clay	Firm Firm	Thumb makes impression easily	300	350	450	600	750	850



Foundation solutions Strip/trench fill

How wide?

Example of an inadequate
plain concrete strip
foundation cast on site





Foundation solutions Strip/trench fill

Concrete mix

1:2:4
C20/C25

In non-aggressive soils, concrete should be composed of Portland cement to BS EN 197-1 and -2 and fine and coarse aggregate conforming to BS EN 12620 and the mix should comply with one of the following recommendations:

- i. in proportion of 50kg of Portland cement to not more than 200kg (0.1m³) of fine aggregate and 400kg (0.2m³) of coarse aggregate; or
- ii. grade ST2 or grade GEN I concrete to BS 8500-2;

Foundation solutions Strip/trench fill

Concrete mix



Type	Use	Strength	Cement	20mm Agg	Sand
C8/Gen 0	Kerb backing, blinding,	8 N/mm2	150	1150	765
C10/Gen 1	Oversite below suspended floor, drainage backing	10 N/mm2	200	1100	770
C15/Gen 2	Footing for small walls, floor slabs	15 N/mm2	225	1090	785
C20/Gen 3/ST 1	Single story foundations, internal floor slabs	20 N/mm2	255	1080	780
C25/ST 2	Foundations, mass concrete and trench fill	25 N/mm2	285	1070	775
C30/ST 3	Driveways, Paths, Garage base, Strural use	30 N/mm2	330	1050	760
C35/ST 4	External slabs for heavy duty applications, Strucural RC	35 M/mm2	365	1030	750
C40/ST 5	Structural RC floors, beams, columbs	40 N/mm2	395	1010	730



Foundation solutions Strip/trench fill

Example of inadequate
strength mixed on site





Foundations Piles

Driven pile foundations
Cast-in-situ pile foundations
Combined pile foundations
End-bearing piles
Friction piles
Bored piles
Driven piles
Screw piles



Foundations Screwed Piles

Screw piling is a method which uses circular hollow galvanised steel pile shafts with one or more steel helices attached to them and can be installed rapidly with minimum sound and vibration disturbance.

Screw piles, also known as helical piles or screw anchors, are fastened into the ground much like a screw is fastened into wood, as opposed to other piling solutions which are driven into the ground or augured and cast in-situ.

Foundations Screwed Piles



The Advantages of Screw Piles

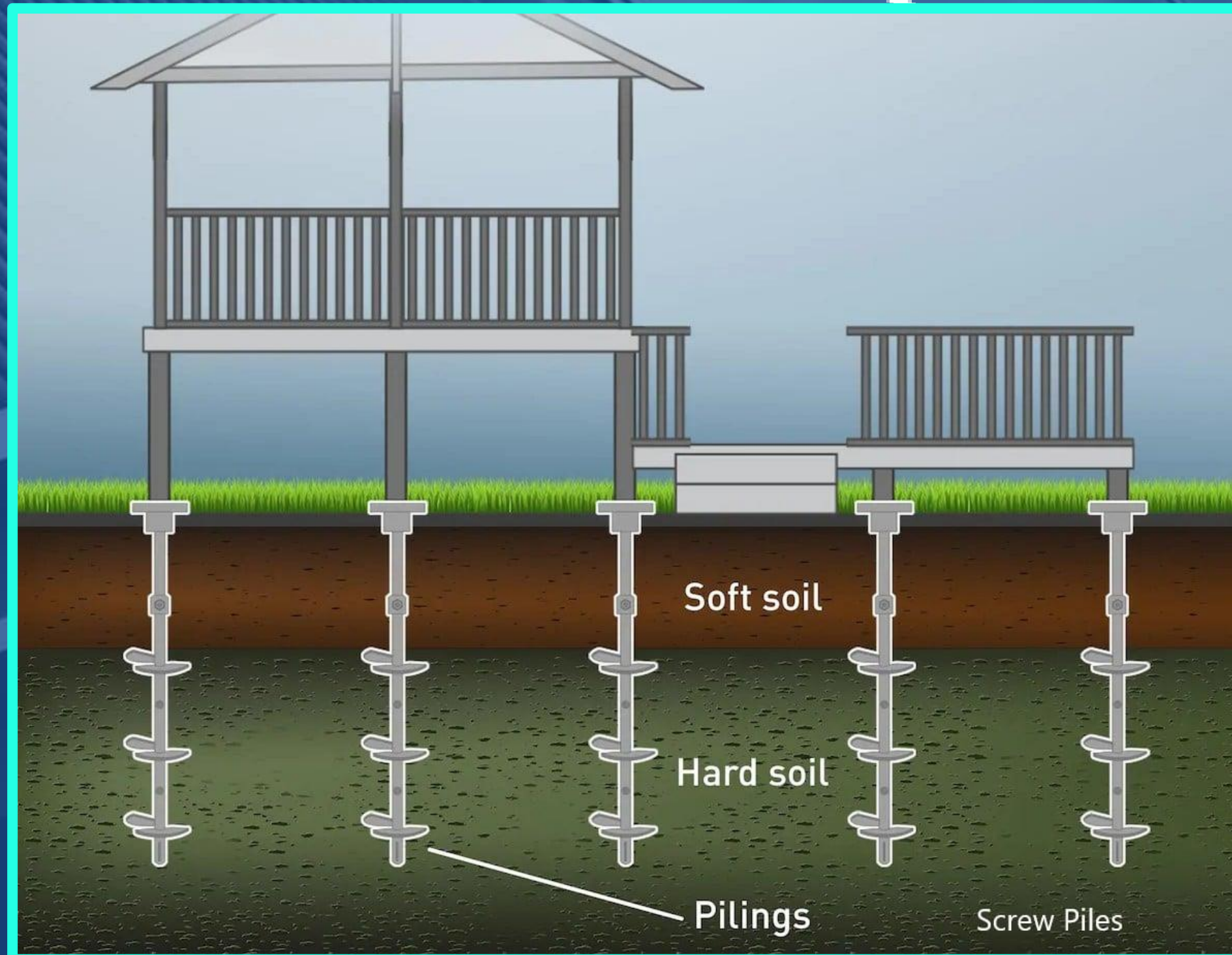
This is an effective and sustainable method of deep foundation support as the required loads can be achieved by putting less material into the ground and taking less out. The piles cut through the ground along a constant angle rather than boring out a hole. Similarly to driven piling, savings can be made not only on timescale but by reducing both the cost of muck away and the carbon footprint of the project.

When the screw pile has achieved its required depth it will remain there and can be topped up with concrete if the design calls for it. In some instances the screw piles can be removed from the ground at a later date if necessary with less complications than other pile types.

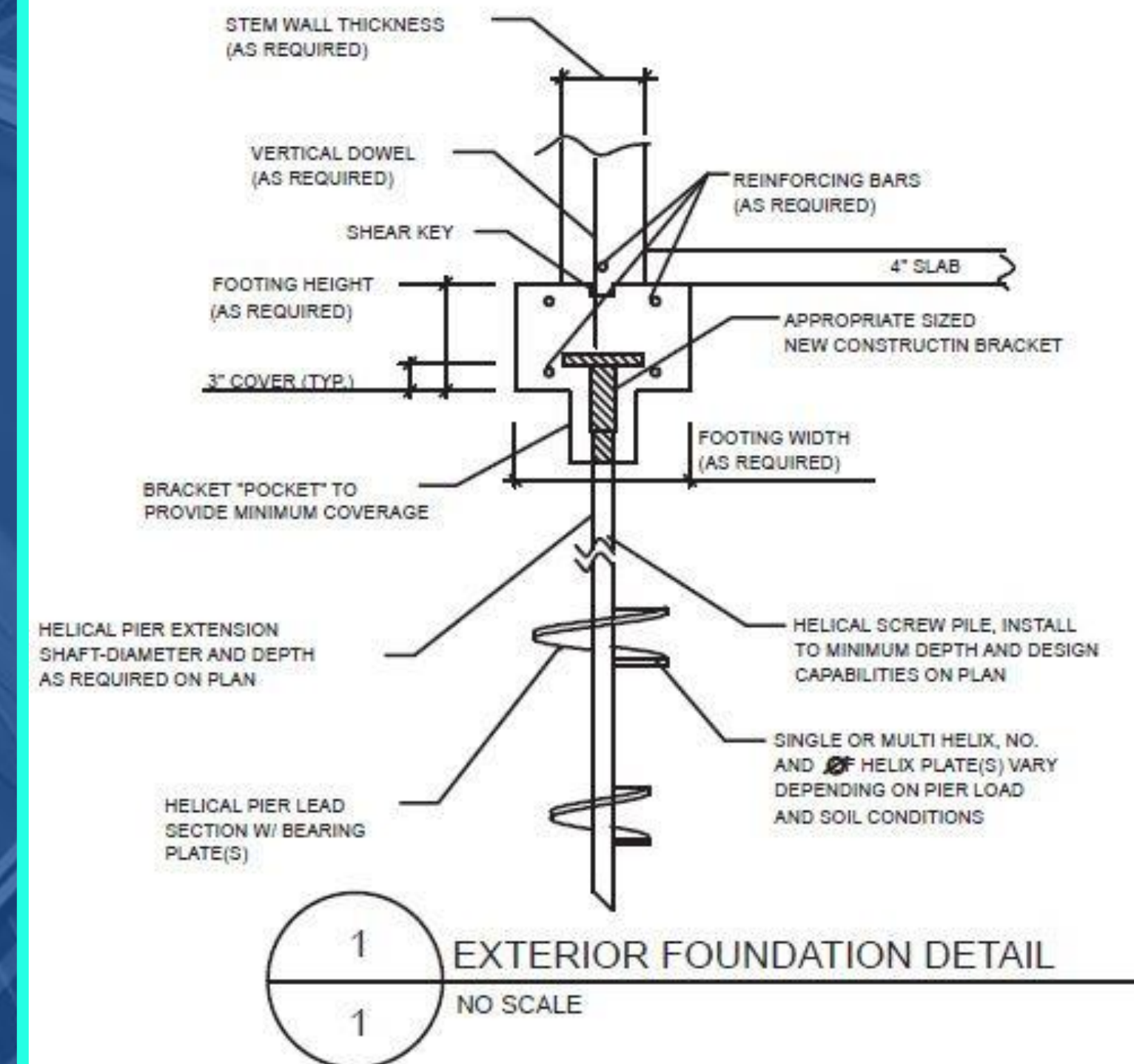
Foundations Screwed Piles

Popular solution for
'Garden Rooms'

Each project to be
specifically designed and
will be subject to checking
by our Consulting
Structural Engineer



HELICAL PIER FOUNDATION PLAN NO SCALE



Foundations Piles

Failures can occur
when installations
are not designed to
accommodate
specific site conditions

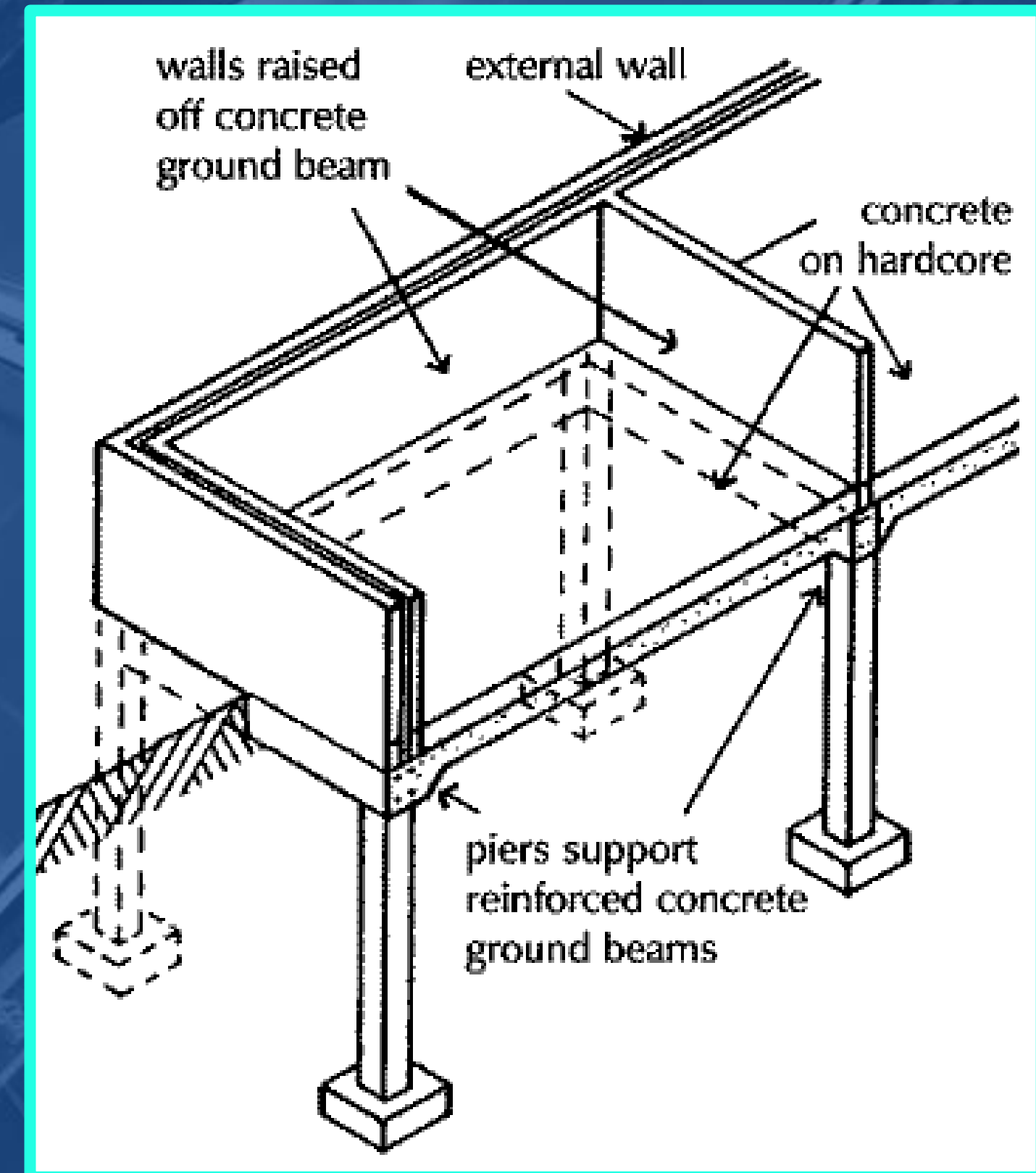


Foundation solutions

Pier and beam

Where required due to existing local obstructions, eg bridging sewers.

Beams (RC or steelwork) spanning between the piers should be by a qualified SE and will be subject to our own internal check.

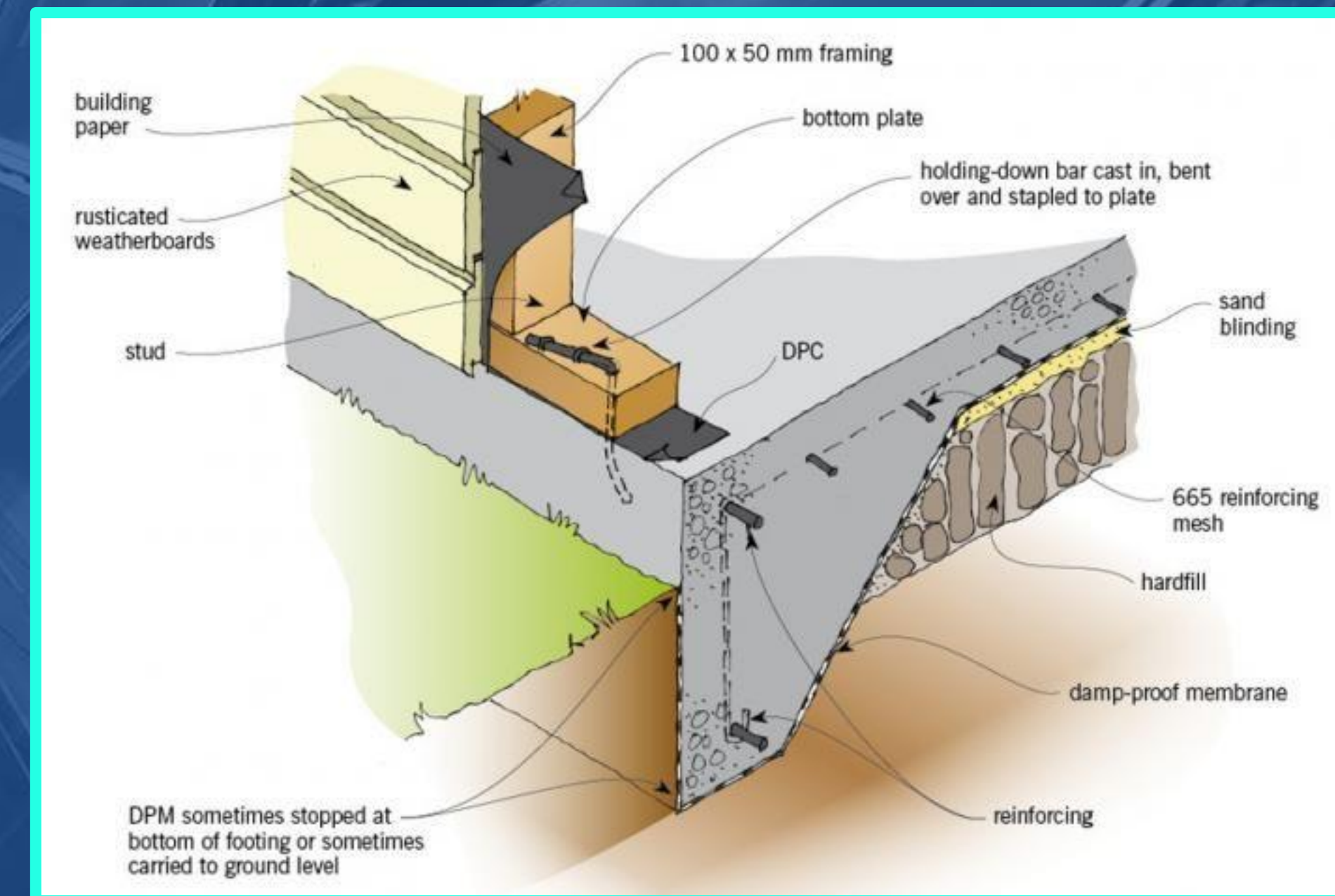


Foundation solutions

Raft

Where required due to existing poor ground conditions, trees etc.

Rafts should always be designed by a qualified SE and will be subject to our own internal check. Differential settlement should be considered with regard to the existing construction.





Foundations Trees

The potential effect of existing trees on the proposed building.

This is often overlooked at the design stage.
In areas of high shrinkable soil the existence of trees
to be noted upon the first inspection.

Foundations Trees

Modified Plasticity Index



Modified Plasticity Index	Volume change potential
40% and greater	High
20% to less than 40%	Medium
10% to less than 20%	Low

Where the PI has not been determined by test, we are likely to work on a **'High Change Potential'**

Foundations Trees

LABC/NHBC Foundation Depth Calculators

<https://info.labcwarranty.co.uk/foundation-calculator>

<https://nhbc-standards.co.uk/4-foundations/4-2-building-near-trees/4-2-13-foundation-depth-tables/>



Foundations Trees



Identification of tree types

<https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/british-trees/tree-id-app/>

Analysis of subsoil

<https://k4soils.com/>



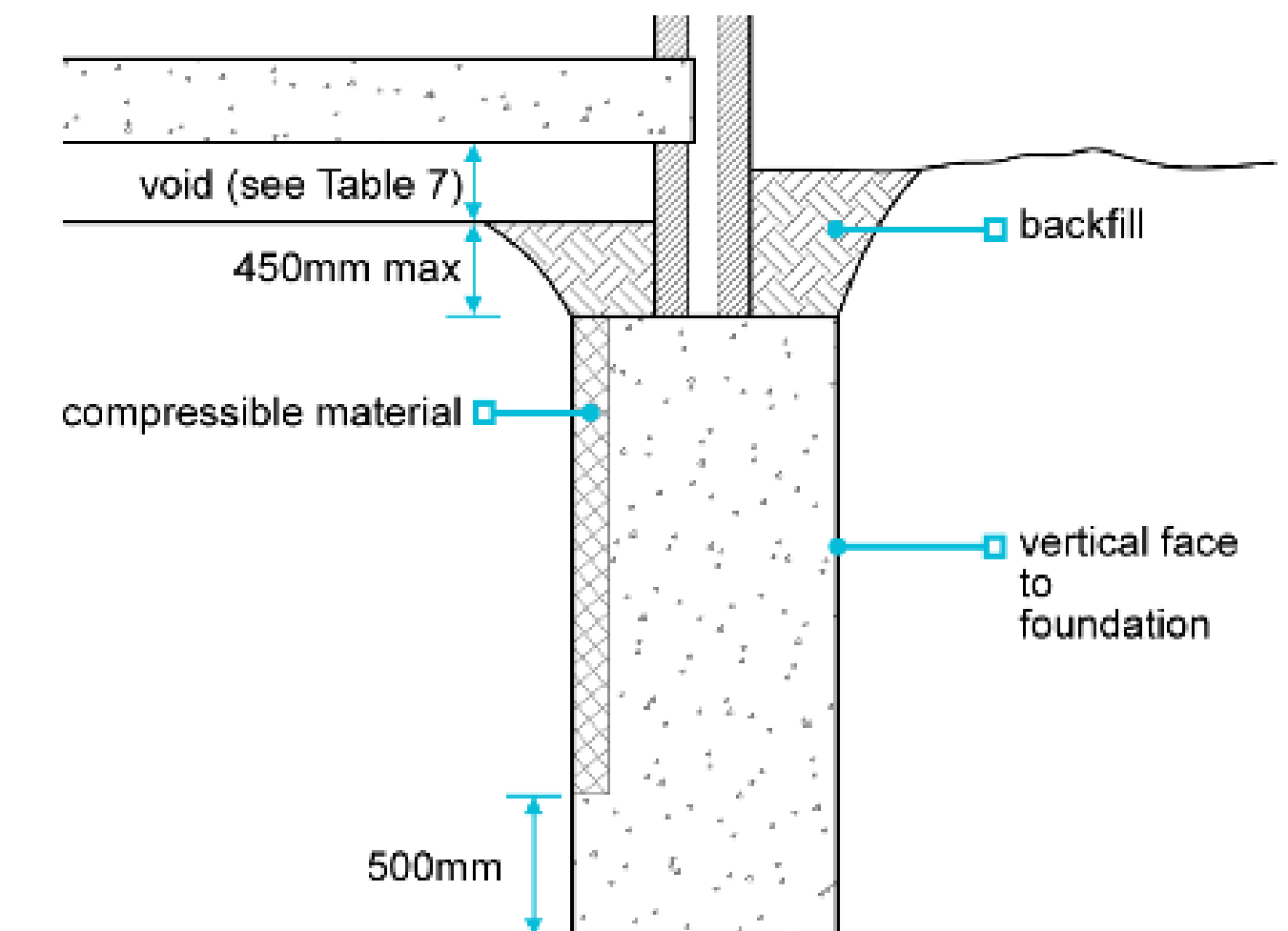


Foundations Trees

Additional provisions

Clayboard protection to protect against clay heave and ground movement to inside faces of external wall foundations deeper than 1.50m.

Figure 4: Heave precautions for trench fill foundations up to 2.5m deep



It is essential that:

- Compressible material is provided to the entire area shown, and the foundation excavation has a vertical face.
- Where the excavation is battered or if there is overbreak or concrete overspill, it may be necessary to consult an engineer.

Foundations Trees



Additional provisions. Suspended Floors are required where the:

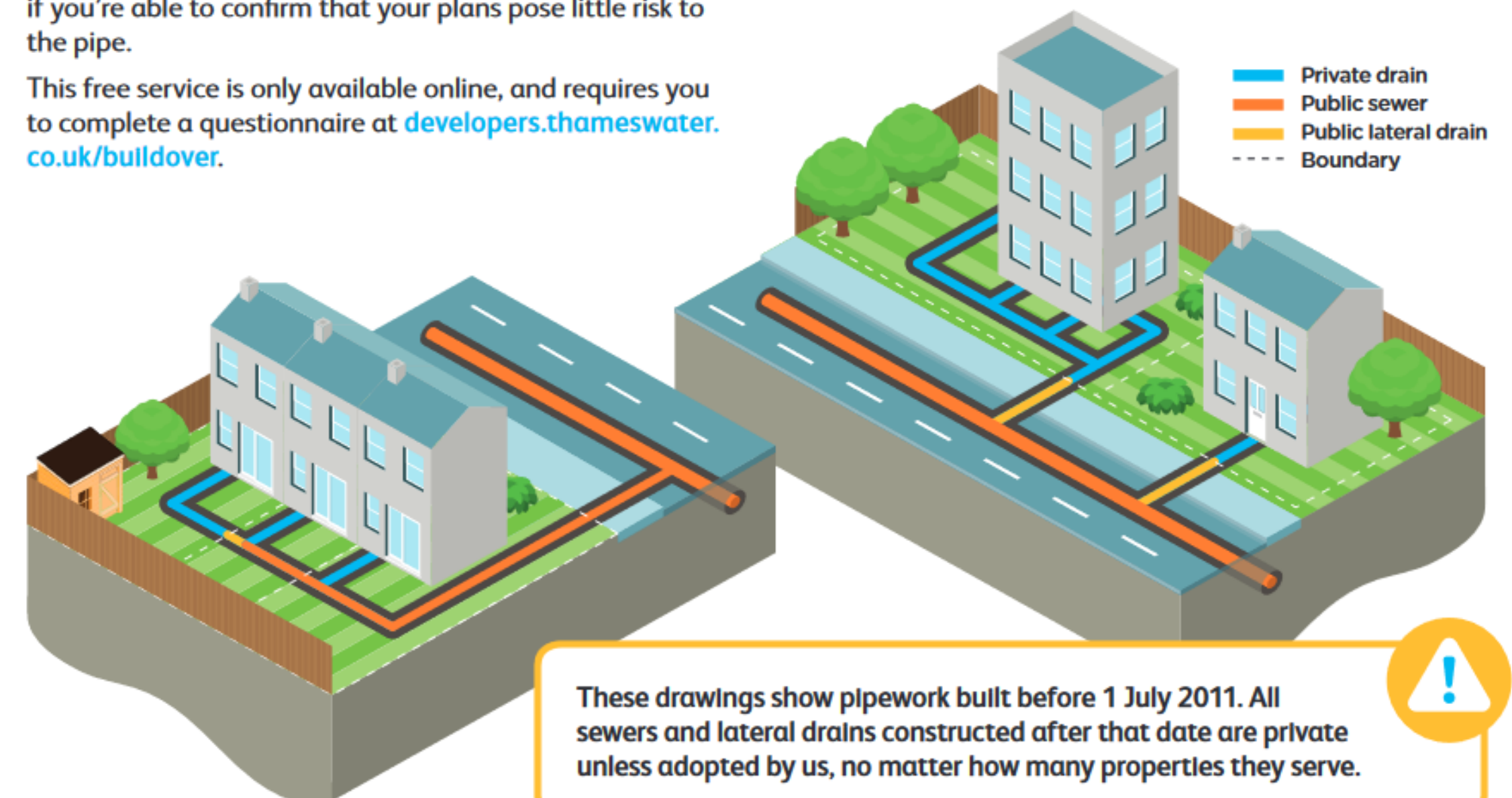
Depth of fill exceeds 600mm,
There is shrinkable soil that could be subject to movement,
Ground has been subject to vibratory improvement, or
Ground or fill is not suitable to support ground-bearing slabs

Foundation solutions Build-Over Consents



if you're able to confirm that your plans pose little risk to the pipe.

This free service is only available online, and requires you to complete a questionnaire at developers.thameswater.co.uk/bulldover.



These drawings show pipework built before 1 July 2011. All sewers and lateral drains constructed after that date are private unless adopted by us, no matter how many properties they serve.

Build-Over Consents



Do you need approval?

You'll need our approval before starting any works if:

- You're building within three metres of a public sewer
- You're building within one metre of a public lateral drain.

Any pipework near where you're planning to build could affect the design so it's best to know where any pipes are when you're planning to help avoid delays and extra cost. If you're not sure how to do this — we're here to help. You can read more about mapped and unmapped pipes below.

For confirmation in writing that our approval isn't needed, email us a scaled ground floor plan of your property, showing your planned work and the complete sewer layout. We'll check your plans and confirm that approval isn't needed.

Drainage

The extension of a dwelling will usually require additional foul and storm drainage connections.



Storm water

The disposal hierarchy should be in the following order of preference:

- 1) Discharge by infiltration to the ground
- 2) Discharge to an open surface water body
- 3) Discharge to a surface water sewer
- 4) Discharge to a combined sewer
- 5) Discharge to a foul sewer

Ventilation of floor voids

Adequate provision to Part C guidance



- b. Ventilated air space measuring at least 75mm from the ground covering to the underside of any wall-plates and at least 150mm to the underside of the suspended timber floor (or insulation if provided). Two opposing external walls should have ventilation openings placed so that the ventilating air will have a free path between opposite sides and to all parts. The openings should be not less than either 1,500mm²/m run of external wall or 500mm²/m² of floor area, whichever gives the greater

Ventilation of floor voids

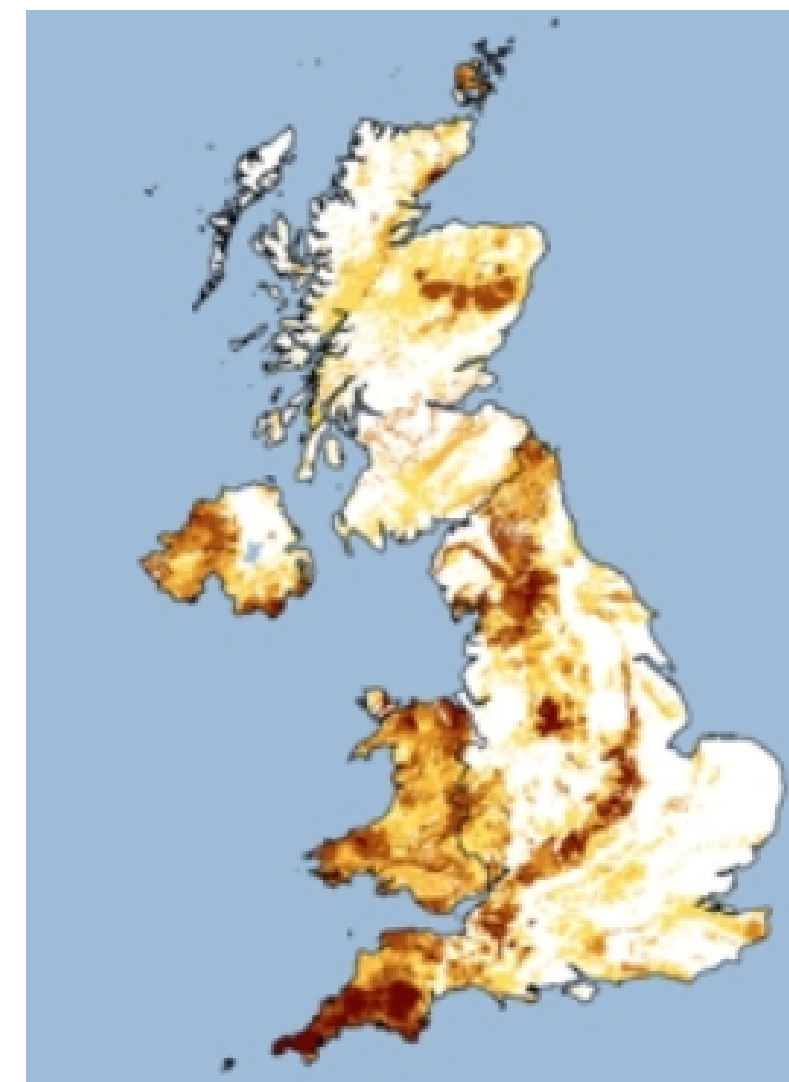
Adequate provision to Part C guidance



- b. a ventilated air space. This should measure at least 150mm clear from the ground to the underside of the floor (or insulation if provided). Two opposing external walls should have ventilation openings placed so that the ventilating air will have a free path between opposite sides and to all parts of the floor void. The openings should be not less than either 1500mm²/m run of external wall or 500mm²/m² of floor area, whichever gives the greater opening area. Any pipes needed to carry ventilating air should have a diameter of at least 100mm. Ventilation openings should incorporate suitable grilles which prevent the entry of vermin to the sub-floor but do not resist the air flow unduly.

Ventilation of floor voids Radon Guidance

www.ukradon.org

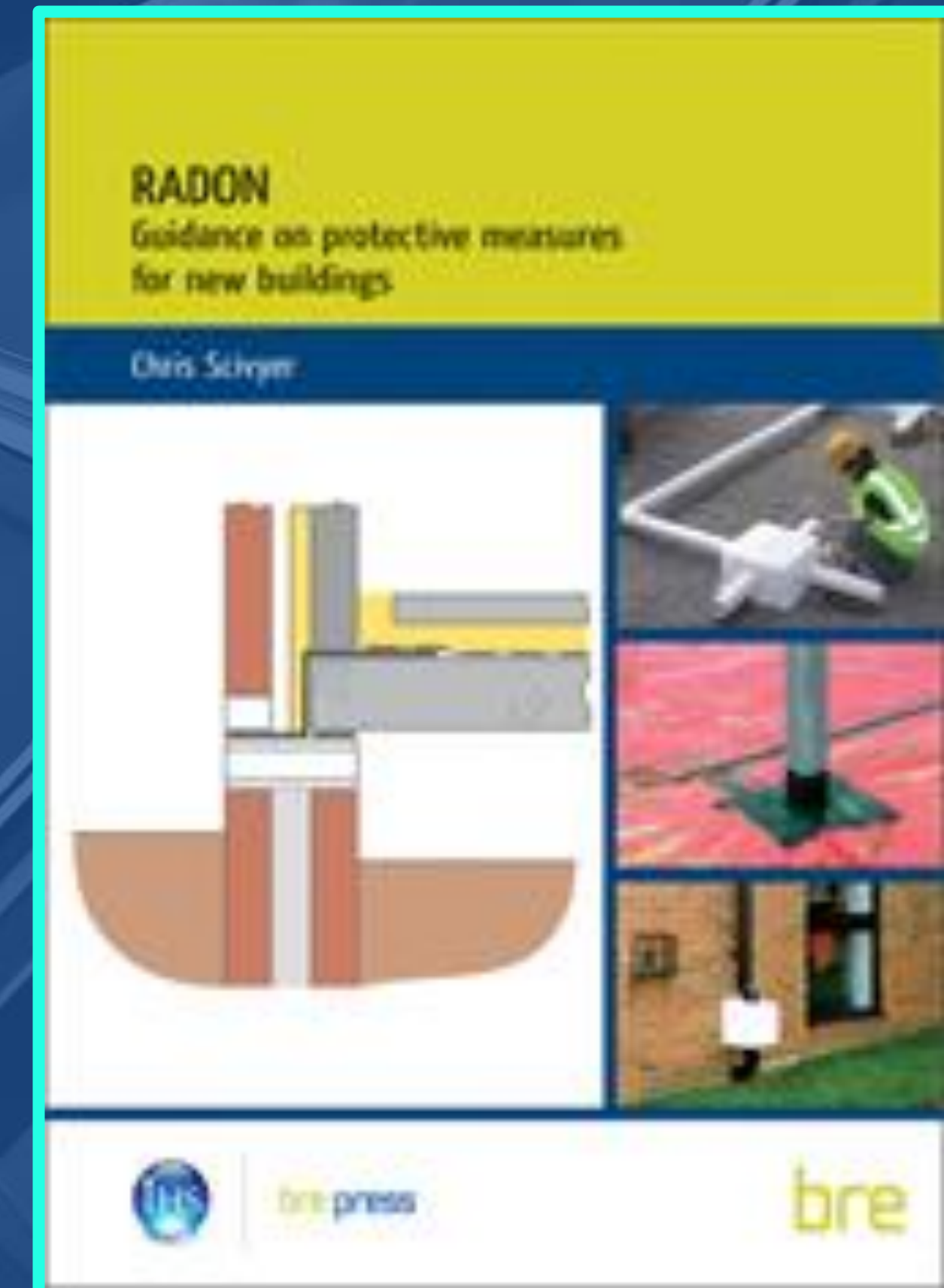
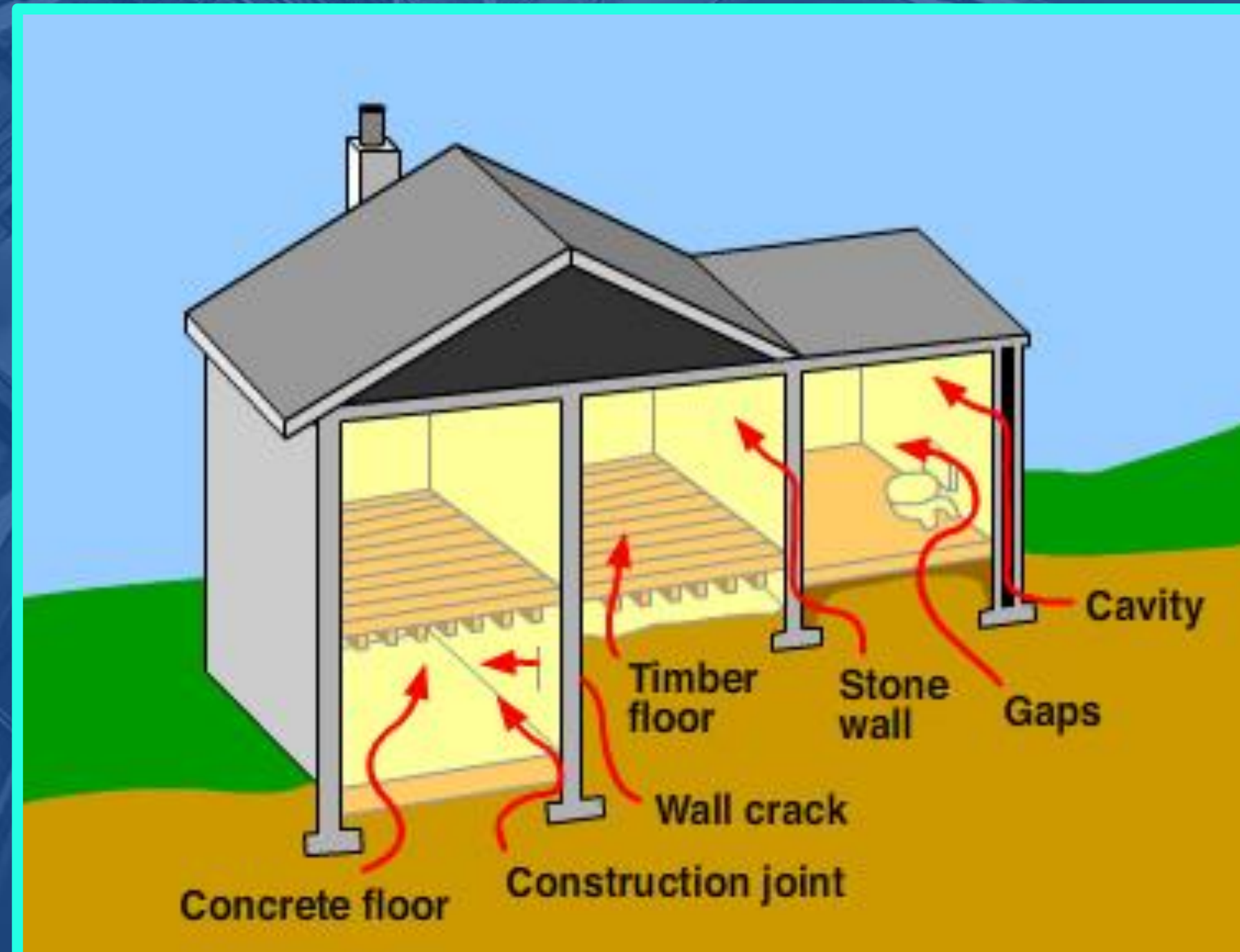


Every building contains radon but the levels are usually low. The chances of a higher level depend on the type of ground. UK Health Security Agency has published a map showing where high levels are more likely.

The darker the colour the greater the chance of a higher level. The chance is less than one home in a hundred in the white areas and greater than one in three in the darkest areas.

[Explore the interactive map](#)

Ventilation of floor voids Radon Guidance





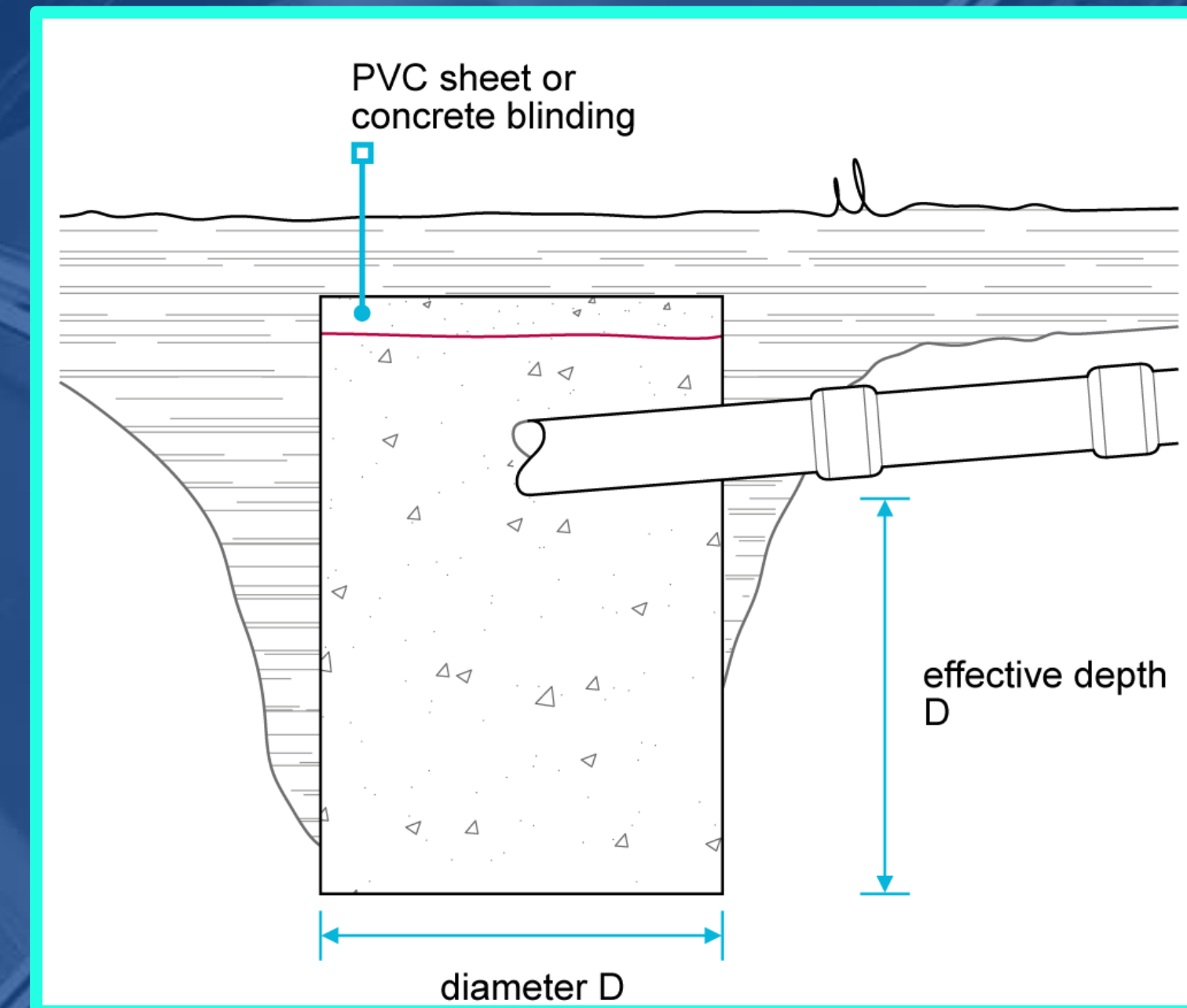
Storm water Simple soakaway

Where subsoil conditions
allow – Percolation test

Min 4.5m from any building

Soakaway volume below
pipe invert

Volume = Area x (rainfall rate/3000)

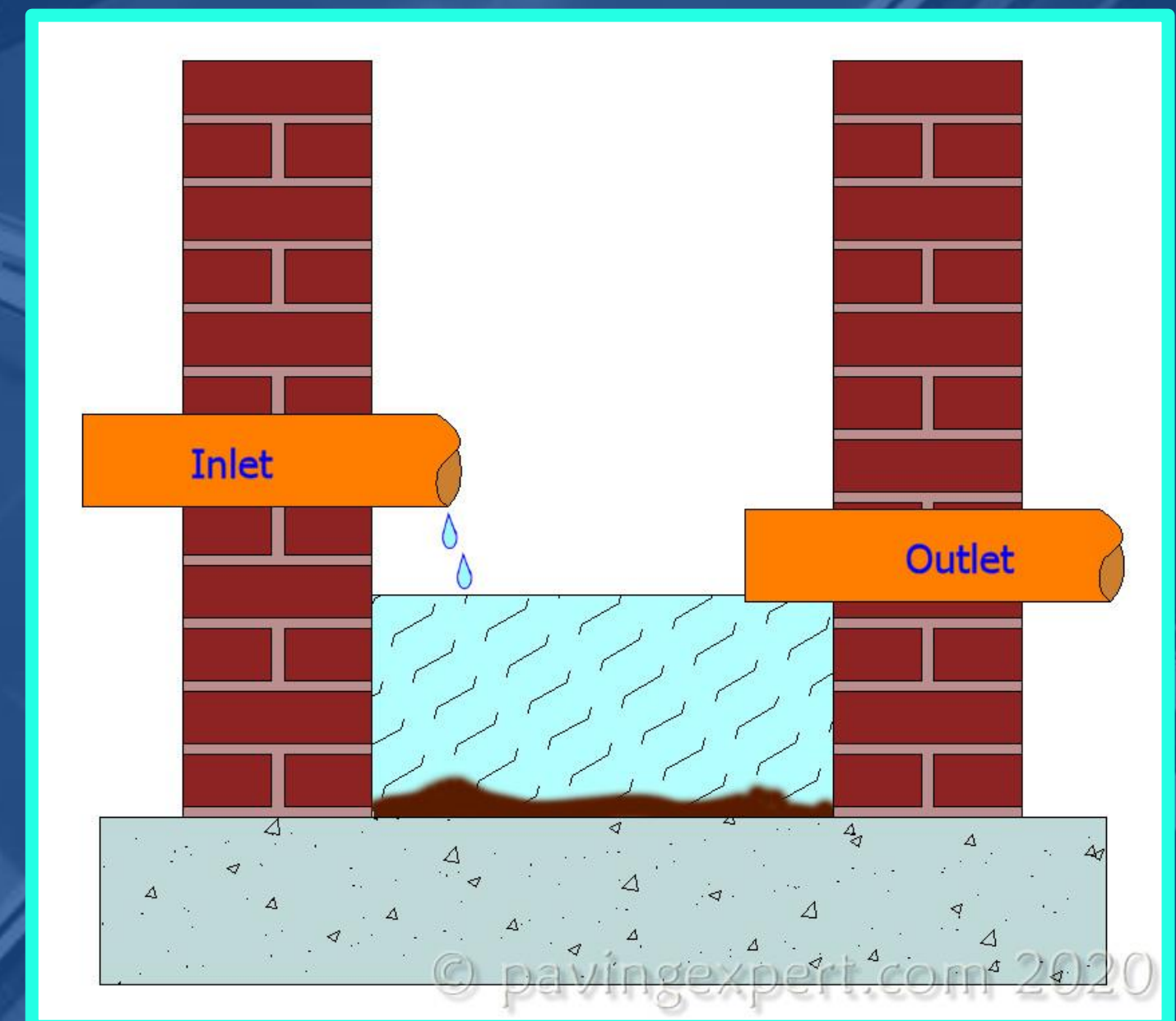




Storm water

Connecting land drains to an storm existing system.

Where land drains (French drains) need to be laid or re-directed, connection should be made via a catch pit.





Foul water

Connecting new drains to an existing private system.

Compatibility of pipework.

uPVC to Vitrified Clay.

Saddle connections
4" to 6" (100mm – 150mm).





Foul water

Connecting new drains to an existing private system in the direction of flow

Using pre-formed uPVC IC units

New brickwork manholes less likely to be constructed nowadays





DPC Arrangements Horizontal and Vertical Damp Proof Course Horizontal

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DPC Arrangements

Horizontal and Vertical Damp Proof Course

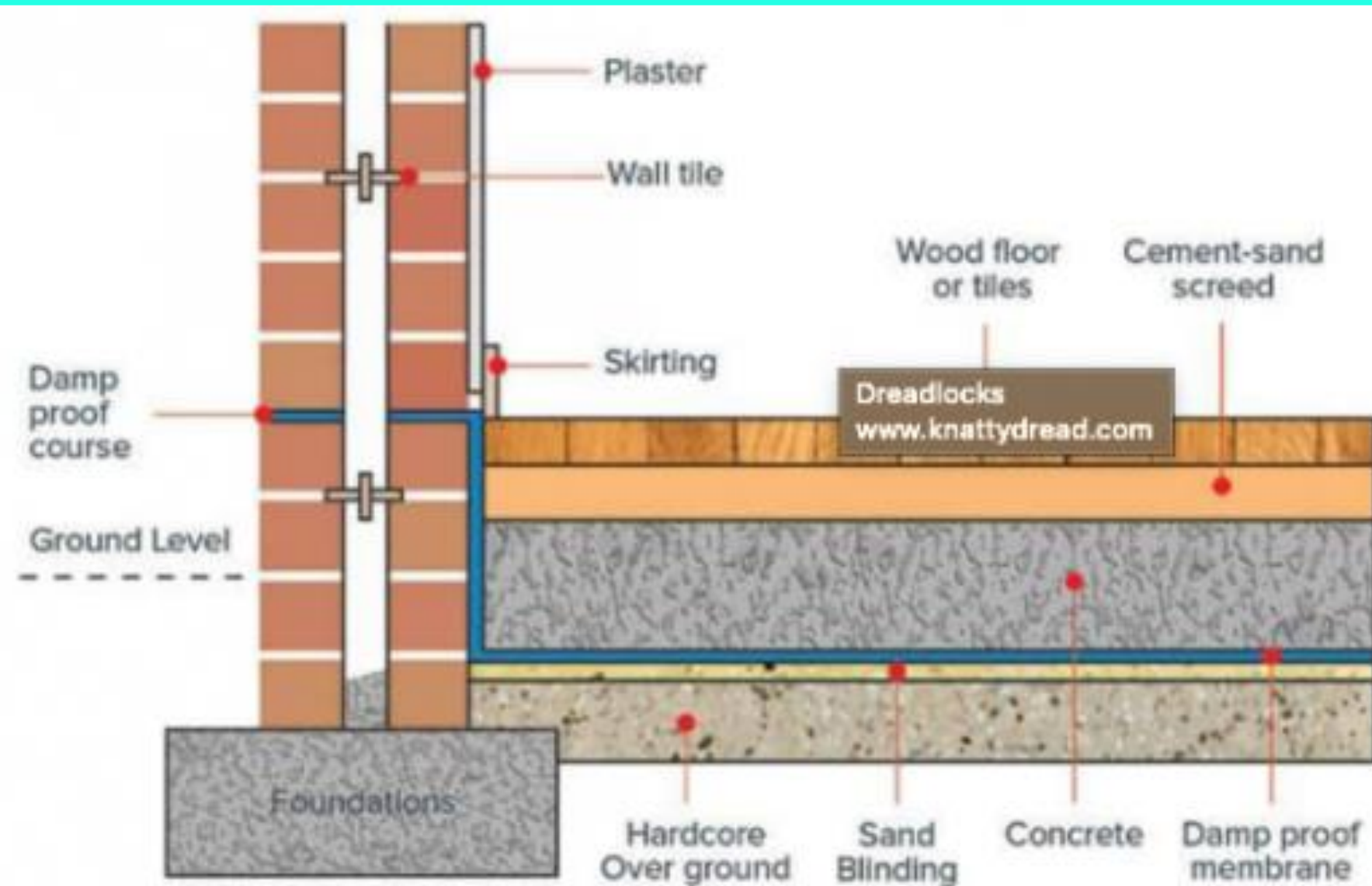
Horizontal

Ensure external leaf DPC is a min of two course above GL

Bed DPC and ensure full laps on corners/continuation

Floor slab DPM to link to inner leaf DPC

Option to step DPC on sloping sites

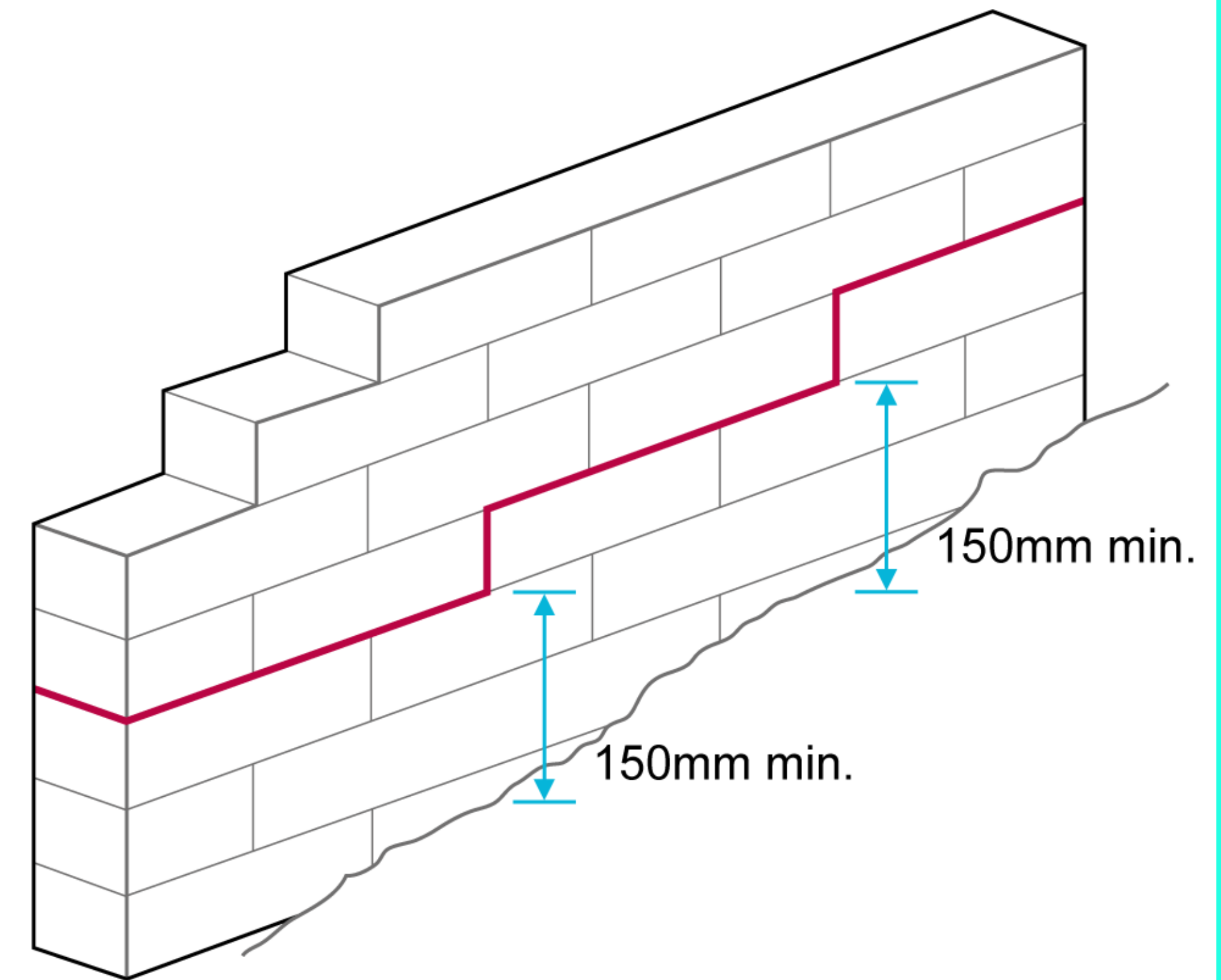
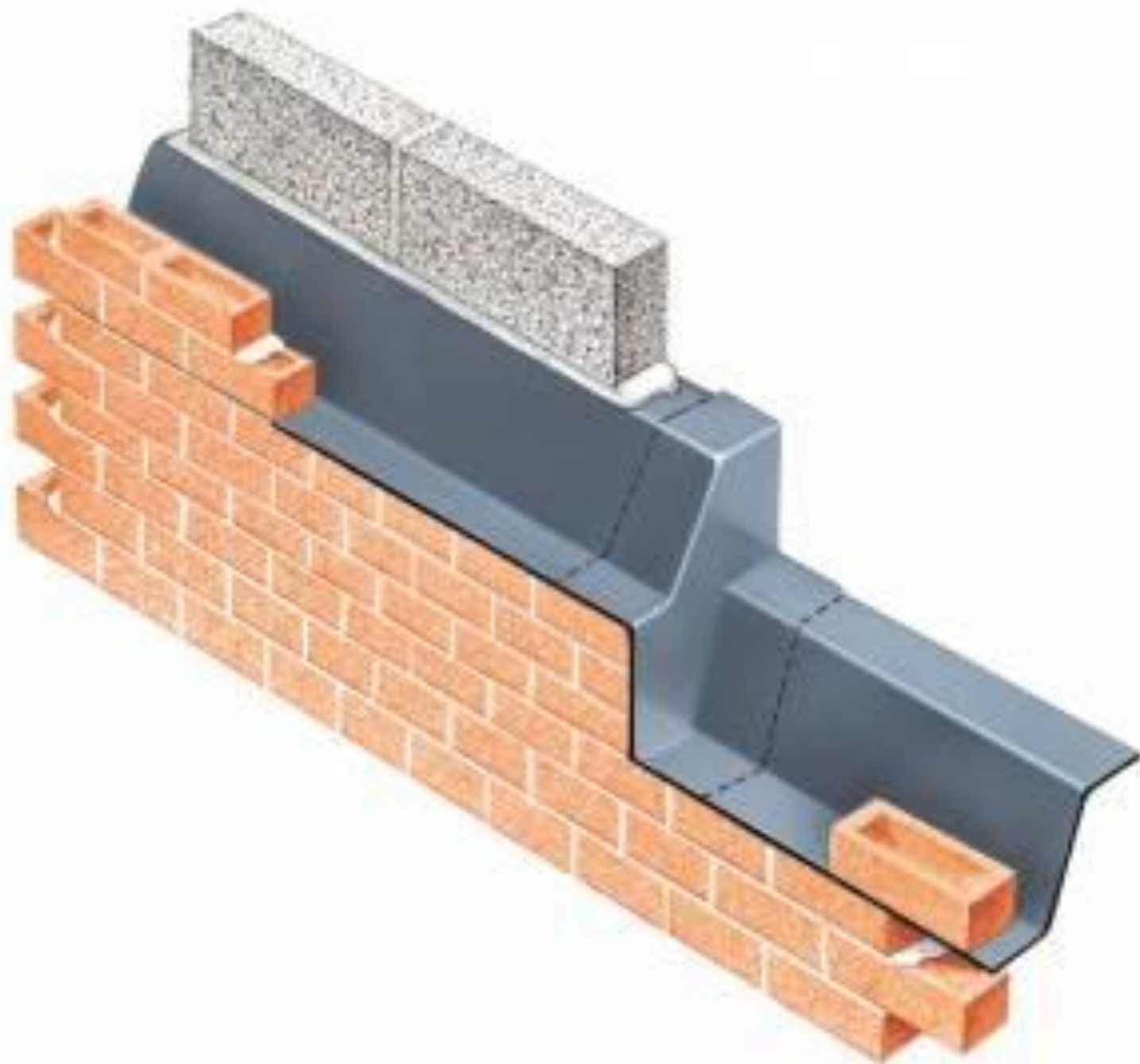


DAMP PROOFING

Stepped DPC

Check corresponding
internal provision

Pre-formed stepped
DPCs are available
Incorporating trays

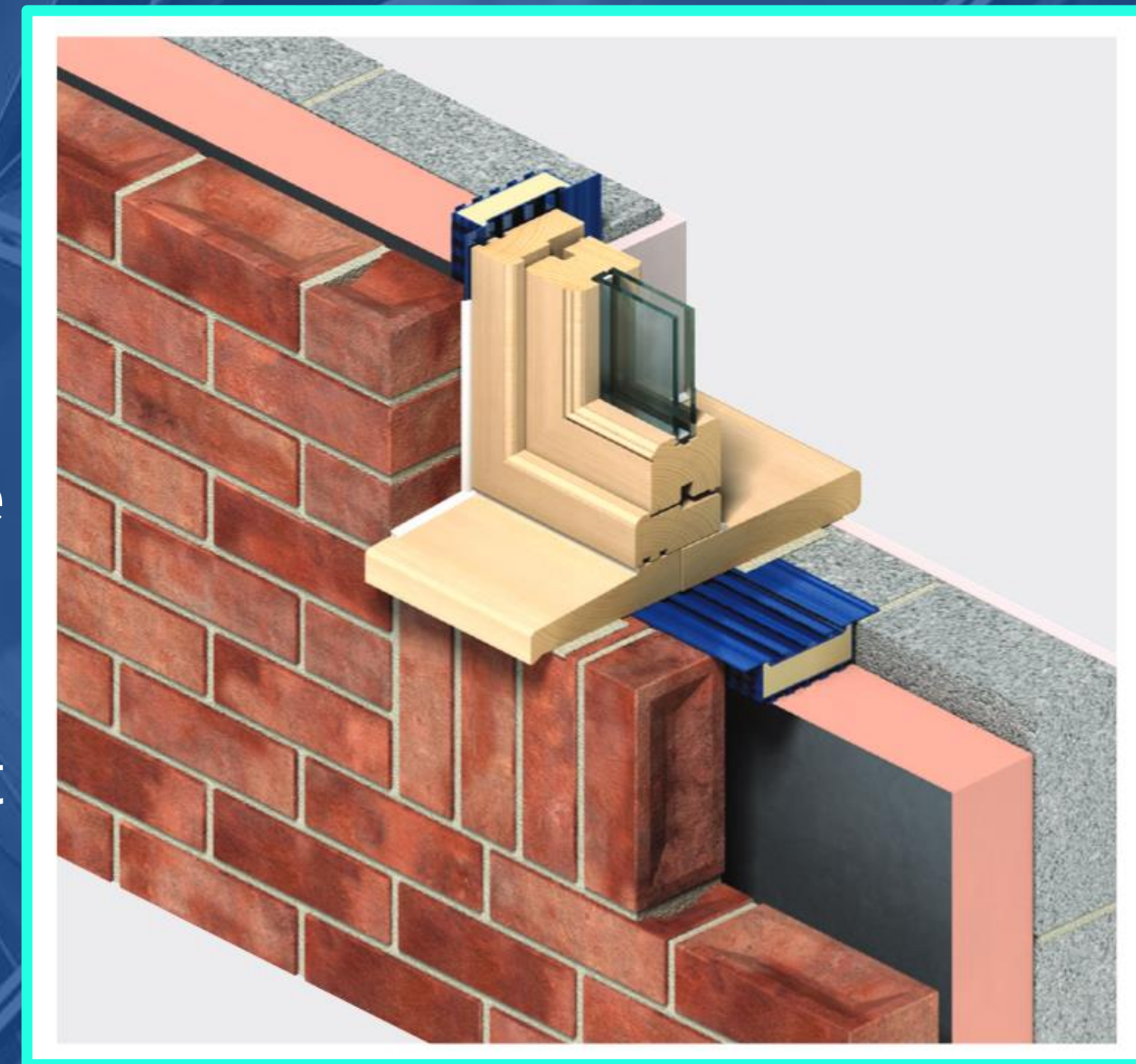




DPC Arrangements Vertical DPC

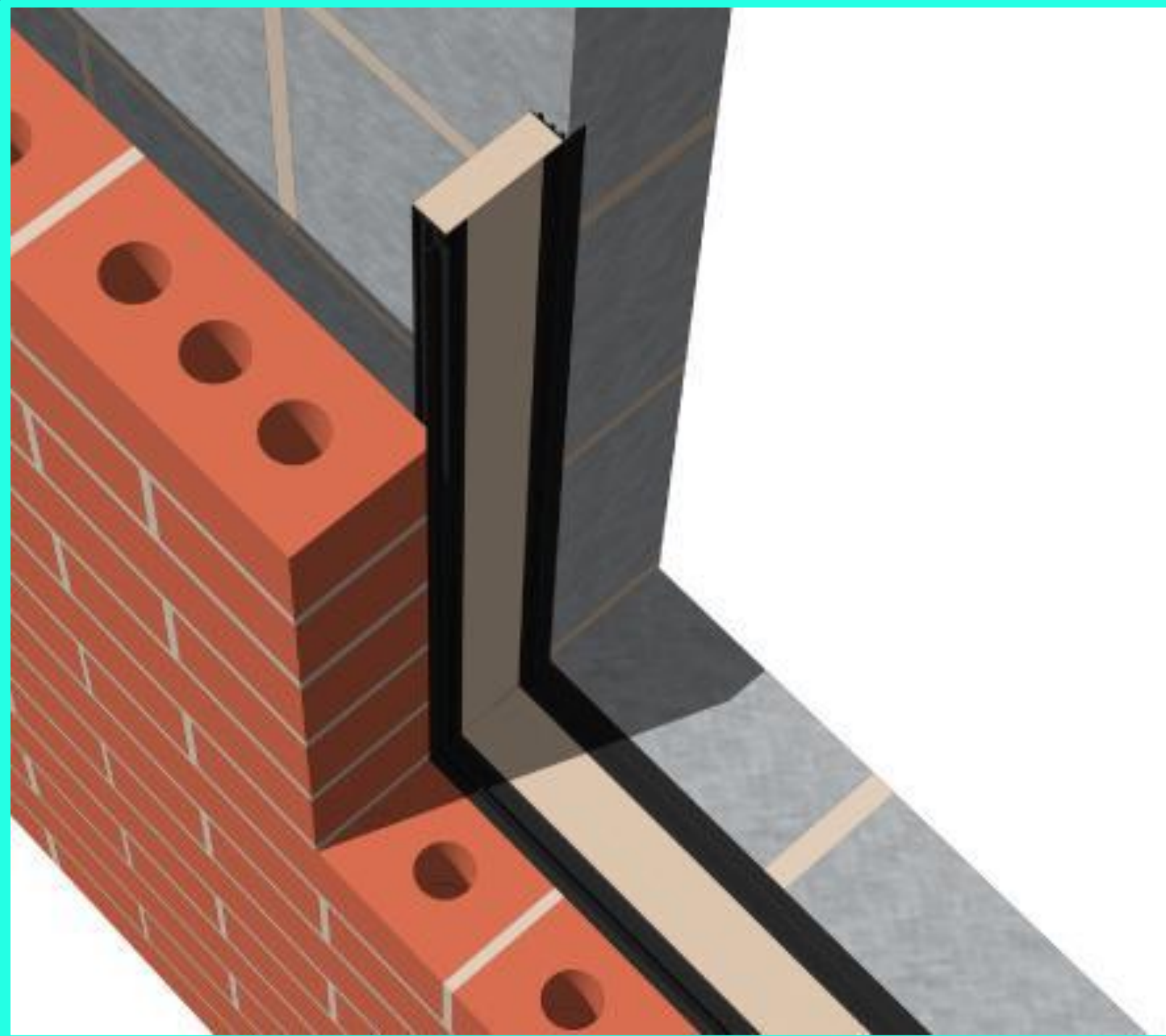
Closer to prevent cold bridge
and prevent damp ingress

Example of a proprietary unit



DPC Arrangements Vertical DPC

Closer to prevent cold
bridge and prevent
damp ingress





Cavity wall
insulation

Cavity width

Insulation type

Cavity closers

Wall ties



Cavity wall insulation

Cavity width

No requirement dependant on insulation specification and U value (typically 0.28) being met



Check whether the insulation is suitable as a 'full-fill' application or a residual cavity is required – this will be specific to individual materials

Where a warranty provider is appointed, you should also check if they have any additional requirements

Cavity wall insulation Full fill



CAVITY

ROCKWOOL® Cavity insulation is a semi-rigid, full-fill insulation solution for masonry cavity wall construction, suitable for use in new builds or extensions.



Cavity wall insulation

Full fill

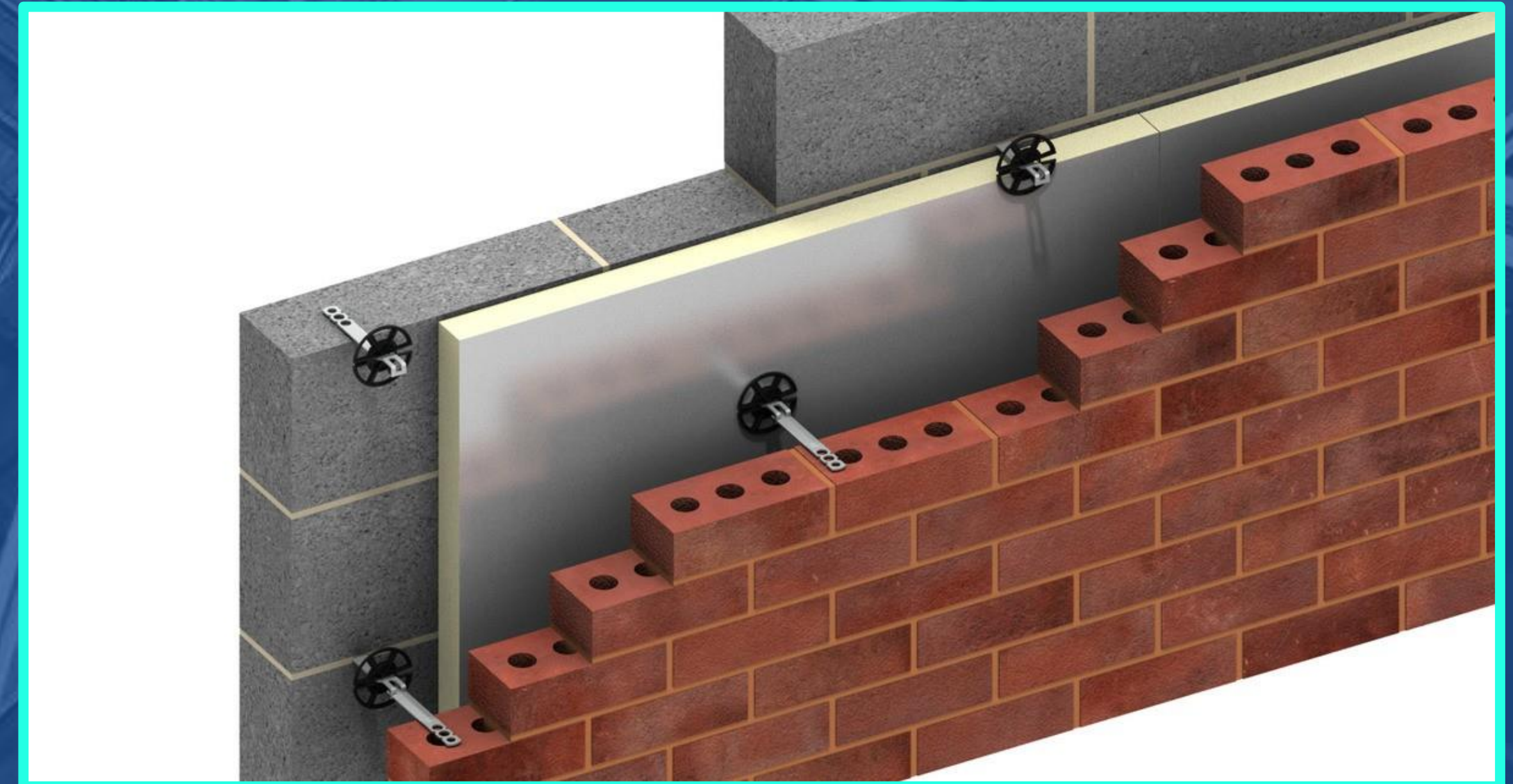


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Cavity wall insulation Partial fill

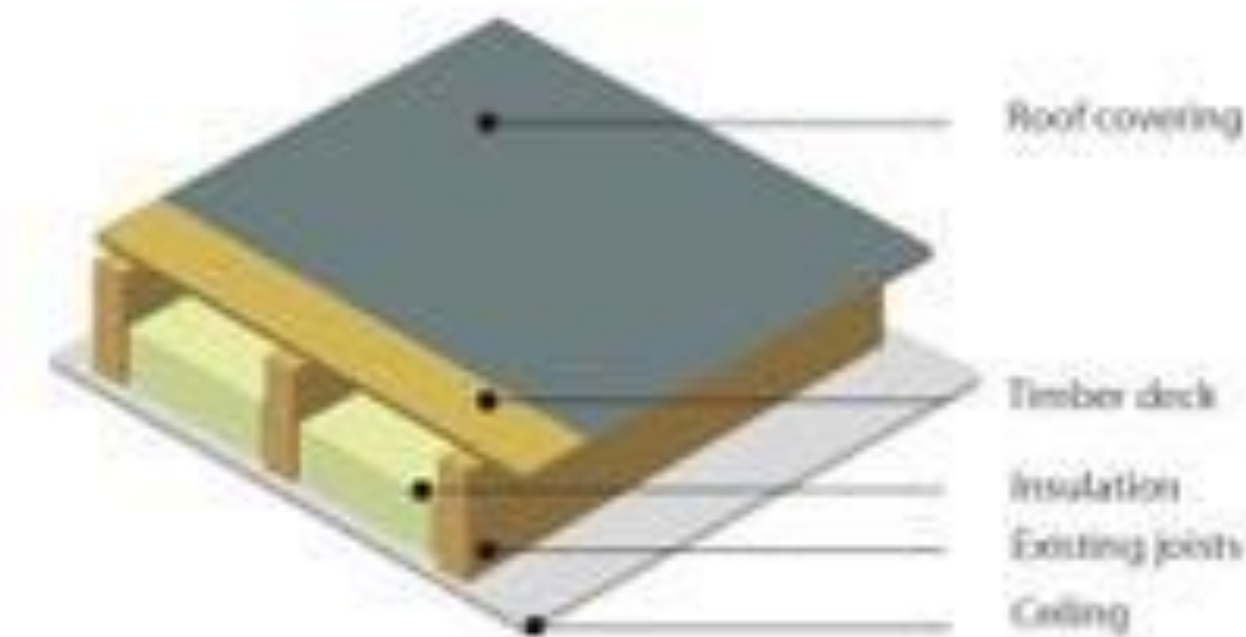


Correct
wall ties



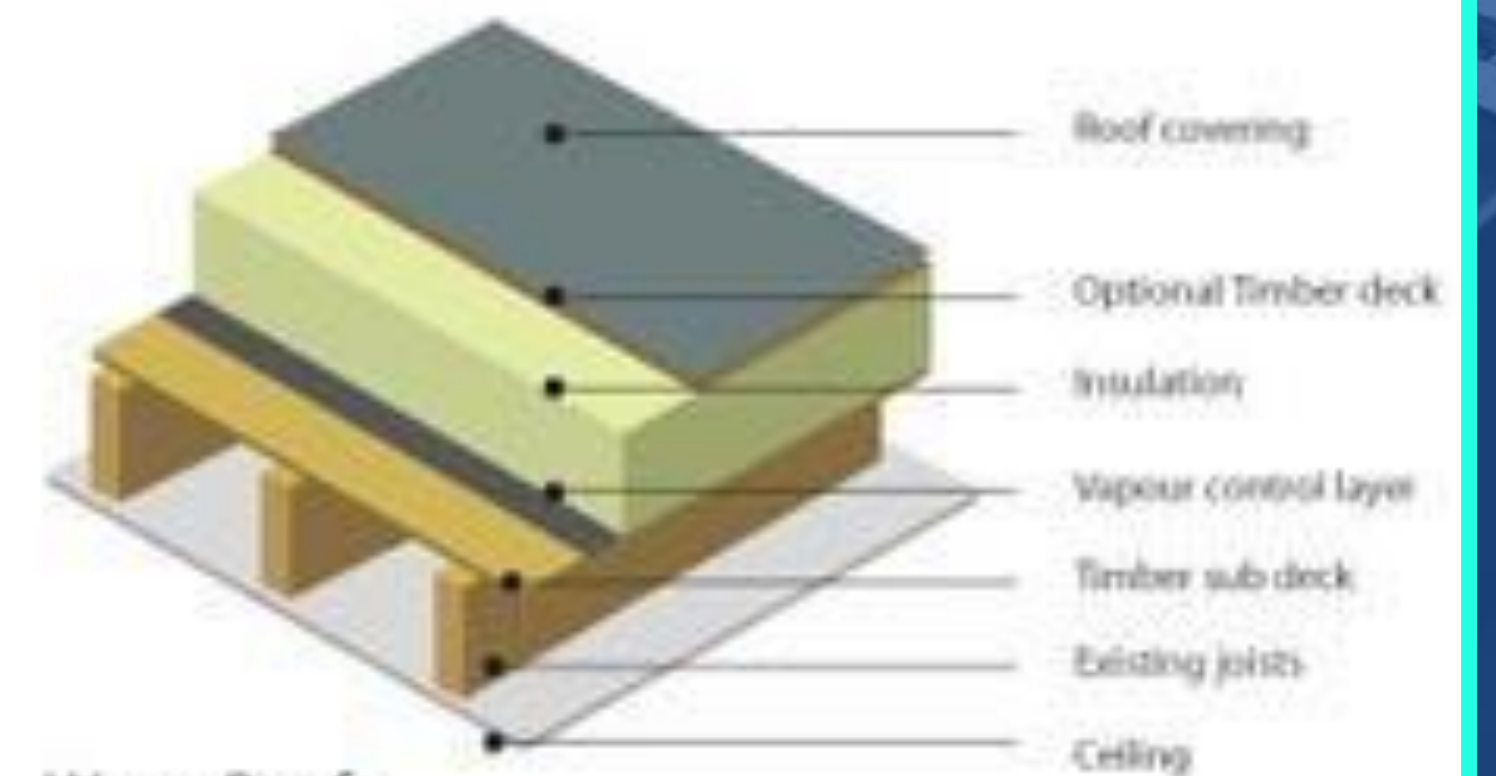
Roof insulation/ventilation

Cold Roof /Warm roof (deck)



Conventional Cold Roof

The flat roof insulation is located between the joists



Warm Roof

The flat roof insulation is located above the joists

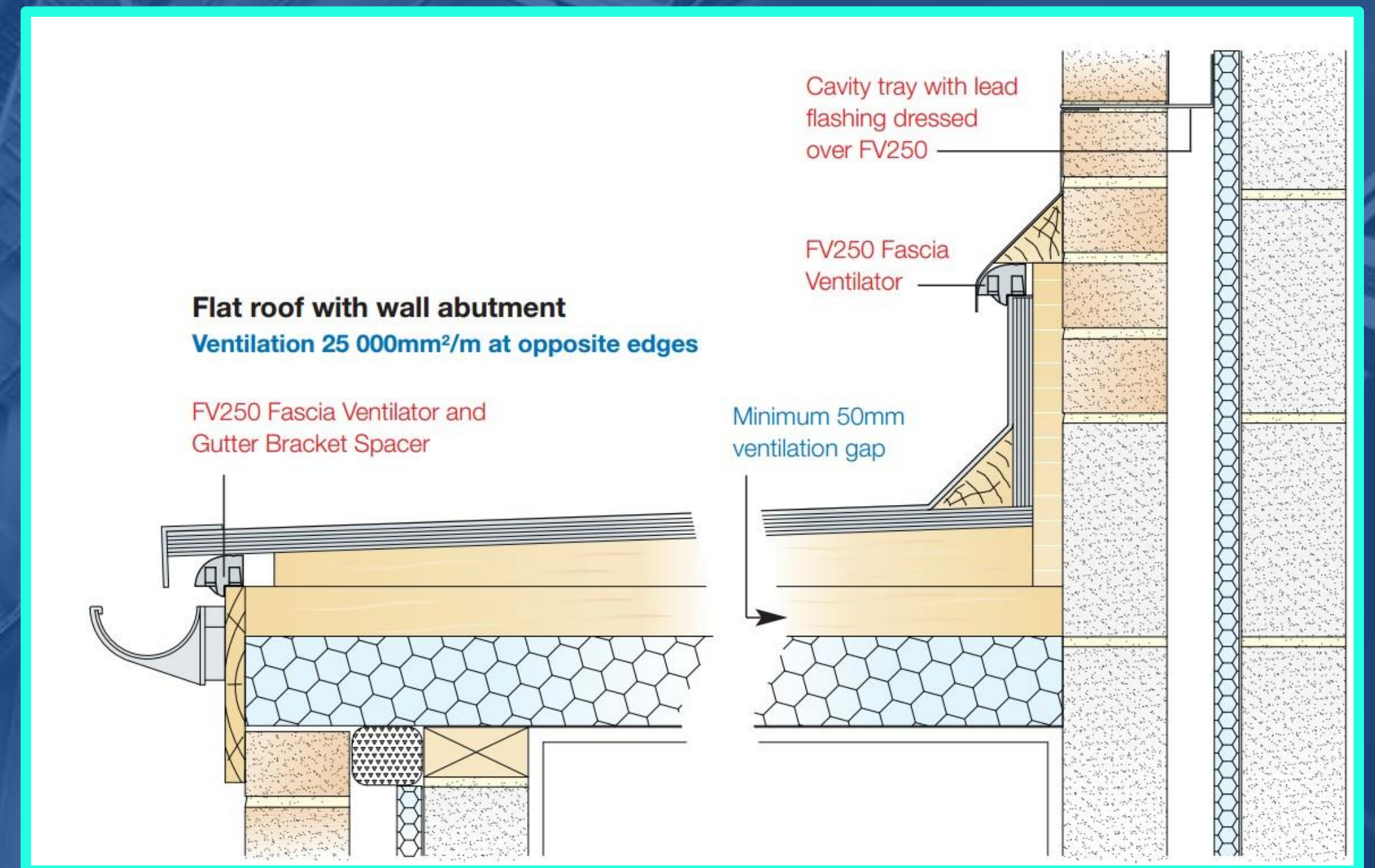


Roof insulation/ventilation Cold Roof /Warm roof (deck) Comparisons

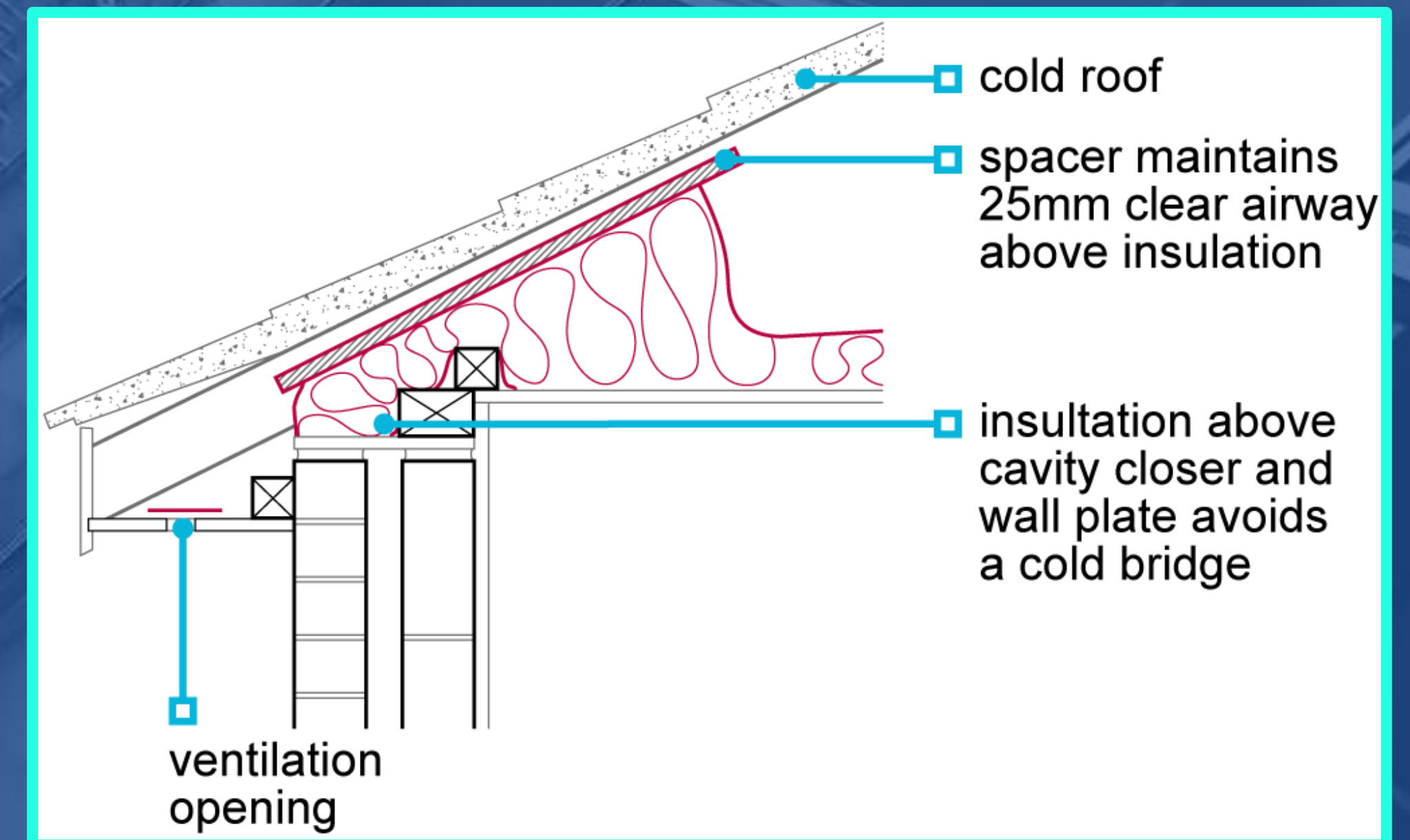
Warm roof will not require cross ventilation
Increased height might not be achievable or allowable (LPA)
Ensure wall insulation meets the deck to avoid cold bridging

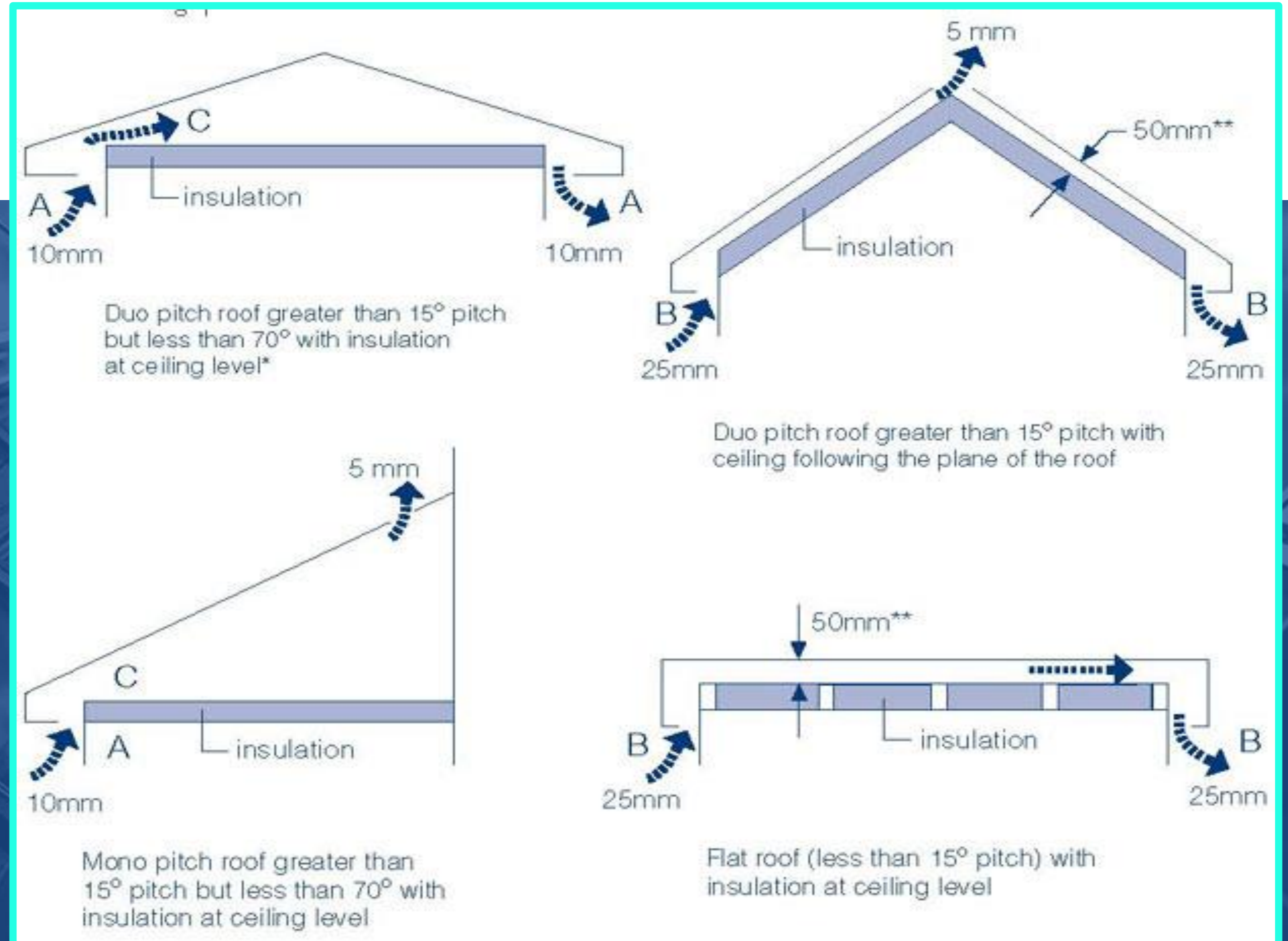
Cold roof requires adequate depth in joist/rafter to achieve U value, dependant on insulation type specified
Roof to be adequately cross-ventilated

Cold Roof Cross-ventilation



Cold Roof Cross-ventilation





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Thank you for listening

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