Pipe insulation requirements for space heating and hot water systems in new dwellings

(Withdrawn - January 2024)

Applicable sites

Warranty and Building Control

Applicable regions

This technical guidance note applies to England, Wales, Scotland

Supersession

This guidance replaces TGN 8.1/10(xv) and 8.1/32(xvi) for all new designs in the respective areas within scope.

Background

This guidance has been written to clarify NHBC technical requirements relating to

- Approved Document L volume 1 (2021)(i) for England
- Approved Document L Wales (2022 edition)(ii)
- the domestic building services compliance guide for Scotland (2022)(iii).
- Northern Ireland Part F1 (2022)(iv) regulation 39 states compliance will be met if provisions are made to limit heat gains and losses from pipes, ducts and vessels in a space heating system or space cooling system including any associated fittings.

This guidance enhances clarification of a void and its requirements of pipe insulation, along with what NHBC would consider to be impractical.

Scope

This document outlines requirements in relation to pipe insulation for space heating and hot water systems for new dwellings, including individual apartments.

This guidance is intended for general information relating to pipe insulation, if in doubt advice should be sought from the local verifier or building control officer.

District, communal or heat networks including heat interface units are not covered in this document.

Who should read this?

Technical and construction directors and managers, architects, designers, contractors, building services engineers and site managers.

Who is responsible?

Those who are responsible for building work (e.g., agent, designer, builder or installer) must ensure that the work follows compliance requirements within NHBC Standards Chapter 2.1 ‘The Standards and Techncial Requirements’ (R1 to R5)

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Specific technical considerations

The Building Regulations within the devolved nations all require provisions are made to limit heat gains or losses from pipes, ducts and vessels in space heating, water or space cooling systems including associated fittings.

Within the 'Scottish Domestic Building Services Compliance Guide 2022'(iii) the following definitions have been added giving clarity over the term void and when space heating pipes should be insulated:

"Pipework serving space heating and hot water systems should be insulated in all areas outside of the heated building envelope. In addition, pipes should be insulated in all voids within the building envelope and within spaces which will normally be heated, if there is a possibility that those spaces might be maintained at temperatures different to those maintained in other zones. The guiding principles are that control should be maximised and that heat loss from uninsulated pipes should only be permitted where the heat can be demonstrated as 'always useful".

Within 'CIBSE Domestic heating guide 2020' the following guidance is given: (xi)

"Pipes should be insulated unless they contribute to the useful heat requirement of a heated room or space. Taking that further, if there is a possibility that the space they pass through (or an adjoining space to the void they pass through) might be maintained at temperatures different to those they are supplying, insulating the pipes should be considered if possible. Reasonable provision should be made to limit heat losses from pipes. The thickness of insulation recommended in Approved Document L of the Building Regulations is related to the thermal conductivity of the insulation material, provided that the thermal conductivity does not exceed 0.045 W/m K. The relationship between insulation thickness and thermal conductivity must comply with the requirement for a maximum permissible heat loss when the water temperature is 60°C and the ambient still air temperature is 15°C.All pipes connected to hot water storage vessels, including the open safety vent pipe and the primary flow and return to the heat exchanger, should be insulated for at least 1m from their points of connection or to the point at which they become concealed".

This technical guidance document highlights the additional requirement for space heating pipes to be insulated within the intermediate floor void and all unheated areas, where practical to do so. The requirement to insulate pipework, is in addition to any fabric insulation required by the Building Regulations.

Areas considered to be impractical to install insulation include:

- where pipes are located within the adhesive zone, behind plasterboard dry linings.
- where pipes are located behind plasterboard to a brick and block type construction utilising batons.

General provisions

- all pipes located within intermediate floors to where they transition to run behind plasterboard requires insulation to the transition point. for clarity the bend radius to the point within the intermediate floor would satisfy this
- when installing pipes through timber joists, to prevent excessive hole diameters the insulation should only be applied between each joist and the pipe wrapped where they pass through the joist so they can move freely and without noise.

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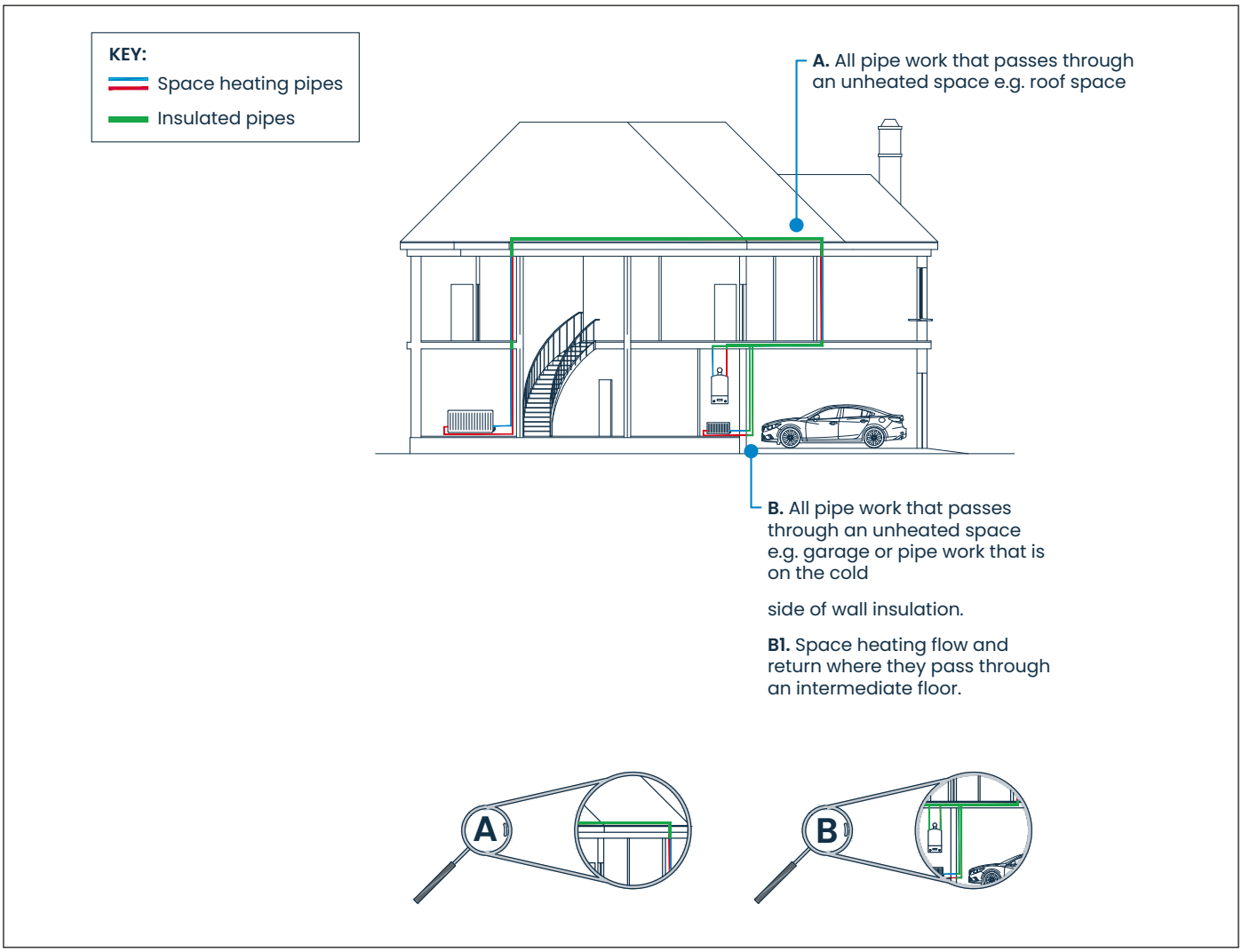
Combi, regular, system boilers and heat pumps without hot water storage

The following pipework should be insulated:

- pipework – within a garage (outside the heated living space)
- pipework – that passes through a roof space (outside the heated living space)
- pipework that passes through an external wall cavity, that is on the cold side of the external wall insulation (outside the heated living space)
- the primary heating flow and return where they pass through an intermediate floor (void)
- flow and return pipework where they pass through an intermediate floor up to the transition point where the pipework drops to radiators below (see general provision).

Pipework should be insulated to meet the minimum requirements in **Appendix A**



Pipe insulation requirements for space heating and hot water systems in new dwellings

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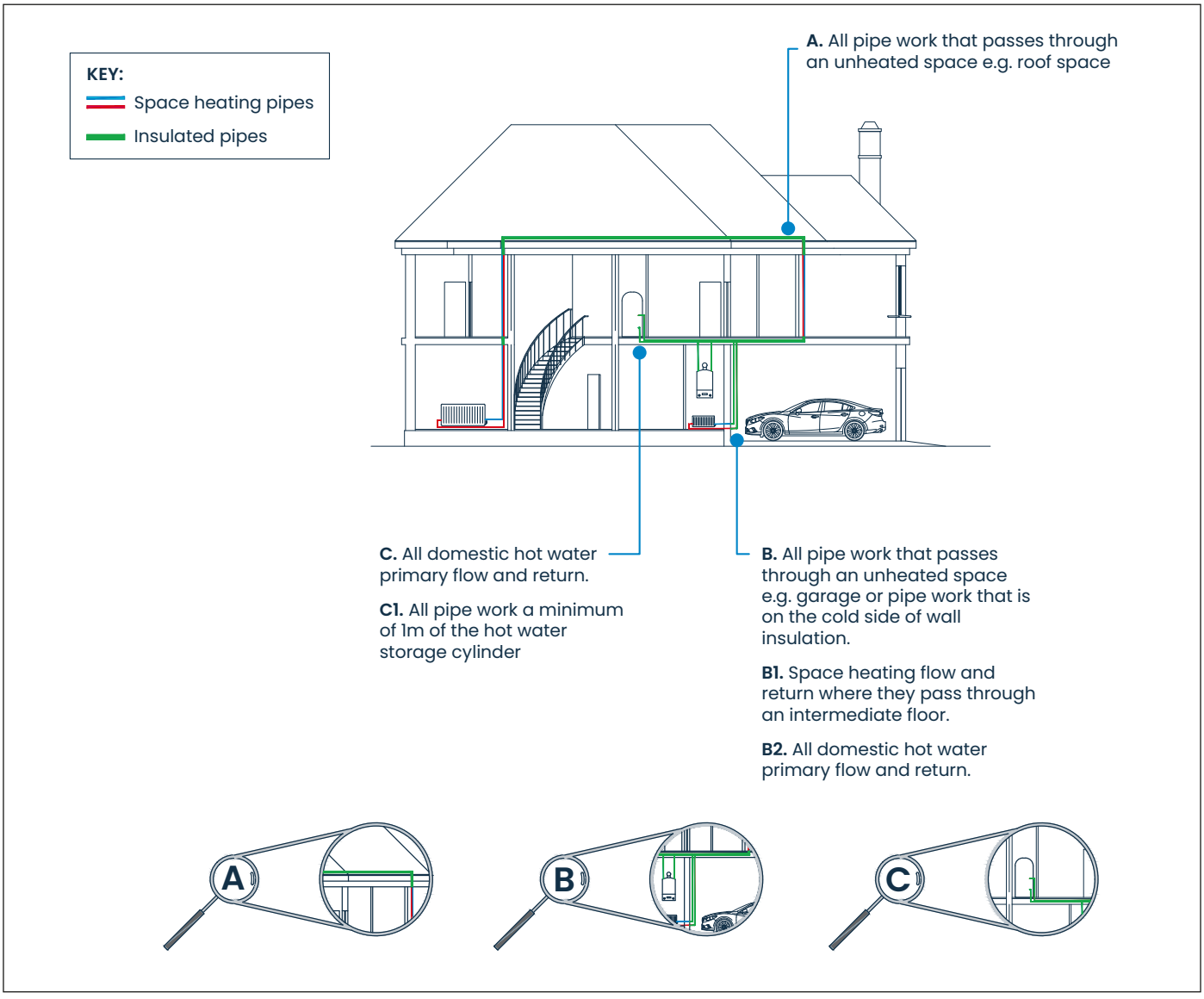
Combi, regular, system boilers and heat pumps utilising hot water storage

The following pipework should be insulated:

- pipework within a garage (outside the heated living space)
- pipework that passes through a roof space (outside the heated living space)
- pipework that passes through an external wall void that is on the cold side of the external wall insulation (outside the heated living space)
- All hot water primary flow and return including where they pass through an intermediate floor (void)
- space heating flow and return pipework where they pass through an intermediate floor up to the transition point where the pipework drops to radiators below (see general provision)
- pipework within 1m of the hot water storage cylinder, or up to the point where they become concealed if practicable
- If secondary circulation is utilised, insulate all pipework that is kept hot by that circulation.

Pipe insulation and hot water cylinders should be insulated to meet minimum requirements in **Appendix A.**



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Definitions

Dwellings in this document relates to self-contained units to accommodate a single household.

Primary circulation an assembly of water fittings in which water circulates between a heat source and a primary heat exchanger inside a hot water storage vessel including any space heating system.

Secondary circulation an assembly of water fittings in which water circulates in supply pipes or distributing pipes of hot water storage systems.

References

i. AD L Volume 1 dwellings England 2021 (conservation of fuel and power)
ii. AD L Volume 1 dwellings Wales 2022 (conservation of fuel and power)
iii. Domestic building services compliance guide for Scotland 2022
iv. Technical hand booklet F1 Northern Ireland 2022
v. NHBC Standards chapter 8.1.3 Water services and supply including table 1
vi. NHBC Standards chapter 8.1.4 Cold water storage
vii. NHBC Standards chapter 8.1.10 Space heating systems
viii. NHBC Standards chapter 8.1.11 Installation
ix. BS 5422 Method of specifying thermal insulation materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40oC to +700oC
x. BS EN ISO 12241
xi. CIBSE Domestic Heating Compliance Guide 2020
xii. BS 5970
xiii. BS 6351
xiv. BS EN 253 District heating pipes
xv. TGN 8.1/10
xvi. TGN 8.1/32

Additional guidance documents not referenced

BS 3198 Specification for copper hot water storage combination units for domestic purpose

BS 1566-1C opper indirect cylinders for domestic purposes

BS EN 12897 Water supply. Specification for indirectly heated unvented (closed) storage water heaters.

Transitional Arrangements

England – This guidance is based on the current understanding of Building Regulations; and should comply with the following transition period – all new systems to comply with this TGN by Jan 2024

Wales – This guidance is based on the current understanding of Building Regulations; and should comply with the following transition period – all new systems to comply with this TGN by Jan 2024

Scotland – applicable to Building Warrant applications from the 1 February 2023. It should be noted where Building Warrants submitted prior to 1 February 2023 have lapsed (either due to insufficient information being submitted for review or the project not completing within three years of granting of the warrant) the new requirements may be applied, this is however decided by the local authority.

Northern Ireland – None required, existing requirements unchanged.

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Appendix A

Minimum thickness of pipework insulation for hot water services and space heating applications using high performance insulation

- All insulation used should be designed so that the permissible heat losses in BS 5422(ix) for hot water services at 60°C are not exceeded for the different pipe sizes.

Outside diameter of pipe on which insulation thickness is based mm	Thermal conductivity at 40°C W/m/K (insulation thickness in mm)					Maximum permissable heat loss W/m
	0.025	0.03	0.035	0.04	0.045	
8	5	7	9	12	16	7.06
10	6	8	11	15	20	7.23
12	7	10	14	18	23	7.35
15	9	12	15	20	26	7.89
22	11	14	18	23	29	9.12
28	12	16	20	25	31	10.07
32	13	17	22	27	33	11.08

Maximum daily heat loss for hot water storage cylinder

Nominal Volume (litres)	Heat loss kWh/24h
50	1.03
100	1.49
150	1.88
200	2.06
250	2.22
300	2.36
350	2.48
400	2.59
500	2.80

NHBC, NHBC House, Davy Avenue, Knowlhill, Milton Keynes, Bucks MK5 8FP
Tel: 0344 633 1000 Web: nhbc.co.uk

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