

# Guide to BS 5422:2023

Thermal insulation of pipework, ductwork and equipment





# Introduction

BS 5422 provides specification guidance for the thermal insulation of pipework, ductwork and equipment, covering the following applications:

- Conservation of energy, for both cooled and heated systems
- Slow freezing of contents
- Control condensation on cold surfaces
- Protect personnel from exposure to extremes of surface temperature
- Control process or service temperatures
- Limit effects of system on indoor building temperature.

In the case of energy conservation, BS 5422 seeks to strike a balance between economic considerations and CO<sub>2</sub> savings.

ROCKWOOL offers a range of insulation products suitable for building services and HVAC systems which can satisfy the above applications for domestic, non-domestic and commercial use.

For process, industrial and marine applications, including service temperatures greater than 250°C, please contact ROCKWOOL Technical Insulation via [rti.rockwool.com/contact](https://rti.rockwool.com/contact).

## Building Regulations

BS 5422 is referenced in and can be used to comply with the following guidance:

- England: Approved Document L
- Wales: Approved Document L
- Scotland: Technical Handbook Section 6, Building Services Guide
- Northern Ireland: Technical Booklet F
- Ireland: Technical Guidance Document L



## Changes for 2023

While the minimum performance requirements of BS 5422:2023 remain the same as the 2009 edition, the standard now features 'enhanced' performance tables for certain applications. Note that while compliance with these enhanced tables is optional, they are presented as the 'default' option. Therefore, **should a specifier wish to continue using the base-level performance tables, this must be noted in their specification.**

A number of other changes and additions are summarised below.

- Removal of thermal performance data relating to materials no longer supplied
- Pipe diameters now referenced to as 'less/more-than-or-equal-to', leading to the removal of two tables specific to copper pipes
- Legacy 'National Class' reaction-to-fire ratings replaced by Euroclass ratings, in line with current Building Regulations
- Adoption of the more stringent Energy Technology List/Capital Allowance/NES Y-50 targets as an optional 'enhanced performance' set of B-series tables
- District heating tables for secondary systems have been added as Tables 19C and 20C
- Plastic pipes (single wall) are now treated as having no insulative value of their own

## Transitional arrangements

BS 5422:2023 took effect from 30th June 2023, at which point the 2009 version was withdrawn.

Regulatory guidance refers to BS 5422 dynamically; as such BS 5422:2023 will apply to new projects, including those for which planning permission has been achieved.

However, where tender documentation has already been issued to potential installers, or a contract has been awarded, BS 5422:2009 would continue to apply.







# Insulation guidance

There are several key factors which specifiers and designers should consider when choosing insulation for building services and HVAC systems.

## Thermal performance

### Thermal conductivity

Also referred to as a k-value, or lambda ( $\lambda$ ), the thermal conductivity of a material is a number that describes how readily it transmits heat.

Values are expressed in units of Watts per meter per Kelvin (W/mK), and as such are independent of thickness.

Lower thermal conductivity values indicate a better, more efficient thermal performance.

The thermal conductivity of insulation increases with temperature, meaning higher service temperatures require thicker insulation to achieve a given thermal resistance.

When choosing insulation for building services, it is crucial to consider long-term thermal performance and the impact that any degradation over time could have on system performance and costs.

The thermal properties of ROCKWOOL stone wool are derived from pockets of trapped air, with no reliance on blown-in hydrocarbon gases. This provides a stable thermal performance that does not degrade over time, proven to retain its thermal insulation properties for up to 65 years\*.

\*Testing conducted at the Danish Technological Institute in 2023 using ROCKWOOL products taken from an external wall system.

### Thermal bridges

The correct detailing of thermal bridges is paramount to achieving the full benefits of insulated building services.

Historically, wooden block inserts were used at pipe support locations. However, since wood is not an insulating material, this runs contrary to guidance provided in BS 5422:2023.

To satisfy BS 5422, ROCKWOOL recommends specifying RockLap H&V Pipe Supports. Manufactured from high density non-combustible stone wool, Pipe Supports combine high compressive strength with CE-marked thermal performance, minimising heat losses while offering long-term performance.

### Service temperature

BS 5422 covers applications ranging from -40°C to +700°C. It is imperative that the service temperature rating of the chosen insulation product conforms with its intended application.

This information should be readily available on the product's 'Declaration of Performance'.

ROCKWOOL products for building services are rated for use with service temperatures ranging from 0 to 250°C.

Insulation products suitable for service temperatures greater than 250°C are available from ROCKWOOL Technical Insulation, a ROCKWOOL Group company. For more information please contact RTI via [rti.rockwool.com/contact](https://rti.rockwool.com/contact).

*"Additional allowances shall be made to confirm that the specified performance is achieved where system inefficiencies are created through the ageing of the product"*

BS 5422:2023, 5.3.3

*"To limit heat transfer through supports, load-bearing insulating material should be used on the pipe or vessel between the support and the surface to be insulated."*

BS 5422:2023, 5.3.3, Note 2



Surface emissivity

Surface emissivity is the ratio of the energy radiated from a material’s surface, to that of a perfect black body emitter. It is a dimensionless number ranging from 0 (perfect reflector) to 1 (perfect emitter).

The emissivity of a surface depends not only on the material but also on the nature of the surface. A clean and polished metal surface will have a lower emissivity, whereas a rough and oxidised metal surface will have a higher emissivity.

When aiming to limit heat transfer to a fixed value, or achieve a given surface temperature, emissivity impacts the required thickness of insulation as shown in the table below.

Property	Relative thickness of insulation	
	Low ε = 0.05	High ε = 0.90
Heat transfer	Thinner	Thicker
Surface temperature	Thicker	Thinner

All ROCKWOOL thermal insulation products for building services and HVAC systems have a factory-applied aluminium foil facing with an emissivity of 0.05.

Fire performance

HVAC systems and building services typically span the length and breadth of a building, running through compartment walls and floors. In addition, many commercial properties opt to leave pipework and ductwork exposed as a design feature.

With the above in mind, specifiers should be cognisant of how material choice can impact the potential for fire spread, as well as the fire load within a building.

Reaction to fire

The way in which a material behaves under thermal attack is of crucial importance, especially during the early stages of a fire. The reaction to fire of insulation products is classified through BS EN 13501-1, which considers results from the following tests:

- Ignitability
- Rate of flame spread across the surface
- Amount of heat released during combustion
- Rate and level of smoke release
- Character changes, such as release of flaming droplets

Results are assessed and products assigned a rating from A1 (best) to F (worst).

With the exception of A1, ratings are appended with ‘s’ and ‘d’ to respectively indicate emitted levels of smoke and flaming droplets.

Euroclass	Combustibility	ROCKWOOL stone wool insulation is <b>non-combustible</b> , meaning it does not burn, does not contribute to fire growth and presents no smoke hazard.
A1	Non-combustible	
A2-s1, d0		
B	Combustible	
C		
D		
E		
F		

ROCKWOOL insulation products for building services and HVAC systems are non-combustible, and as such will not fuel or spread a fire.

Smoke and toxic gases

Between 2019 and 2022, ‘gas or smoke’ was listed within the cause of just over half of all fire fatalities in the UK<sup>1</sup>.

Smoke consists of particles, vapours and toxic gases, all of which can be harmful to human health.

- Particles irritate airways leading to breathing difficulties
- Vapours are liquid droplets suspended in air, toxic if inhaled or absorbed through skin
- Toxic gases such as carbon monoxide, hydrogen cyanide and hydrogen chloride

In addition, smoke impairs vision making it more difficult for occupants and rescue services to navigate a building.

ROCKWOOL insulation products for building services and HVAC systems are non-combustible, and as such will not contribute any significant toxic smoke.

Compartmentation

It must be ensured that the fire resistance of compartment walls and floors is not compromised when penetrated by building services and HVAC systems.

Insulation systems on pipework or ductwork traversing a fire-resisting division shall maintain the level of fire resistance of the wall, floor or cavity barrier through which they pass.

ROCKWOOL offers a comprehensive range of passive fire protection products, tested to maintain the fire rating where services pass through both walls and floors. For more information, please visit [rockwool.com/uk/firestopping](https://rockwool.com/uk/firestopping).

Acoustic performance

While outside the scope of BS 5422, specifiers should be aware that insulation material choice can impact the level of noise and vibration arising from building services and HVAC systems.

ROCKWOOL stone wool is acoustically absorbent, which helps to reduce noise and dampen vibration.



*In the event of a fire, some insulation systems can generate appreciable quantities of smoke and toxic fumes. Consideration should be given to the choice of materials bearing in mind their location, e.g. enclosed areas or adjacent to air ducts through which the smoke or fumes may spread.*

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*Insulation systems on pipework or ductwork traversing a fire-resisting division shall maintain the level of fire resistance of the wall, floor or cavity barrier through which they pass.*

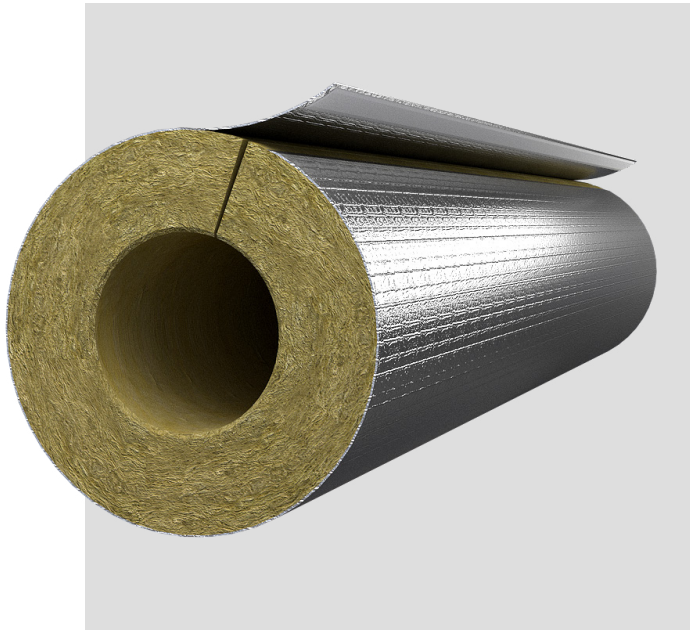
BS 5422:2023

<sup>1</sup> Total of ‘Overcome by gas or smoke’ and ‘Burns and overcome by gas or smoke’, Fire Statistics Table 0504.



# Products

The ROCKWOOL Building Services & HVAC Range comprises a series of solutions which deliver thermal, acoustic and non-combustible performance for Building Services & HVAC applications.



## RockLap H&V Pipe Sections

RockLap H&V Pipe Sections are pre-formed cylindrical sections of stone wool insulation suitable for pipework. Manufactured pre-slit for ease of application, each section features a factory-applied foil facing and self-adhesive lap. The self-adhesive lap allows for easy application and a completely sealed joint.

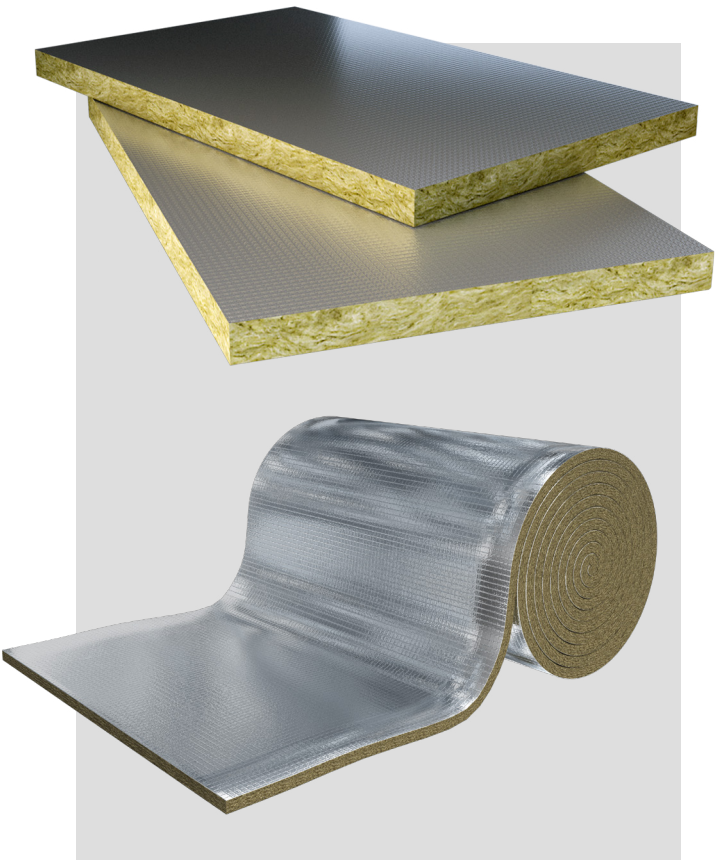
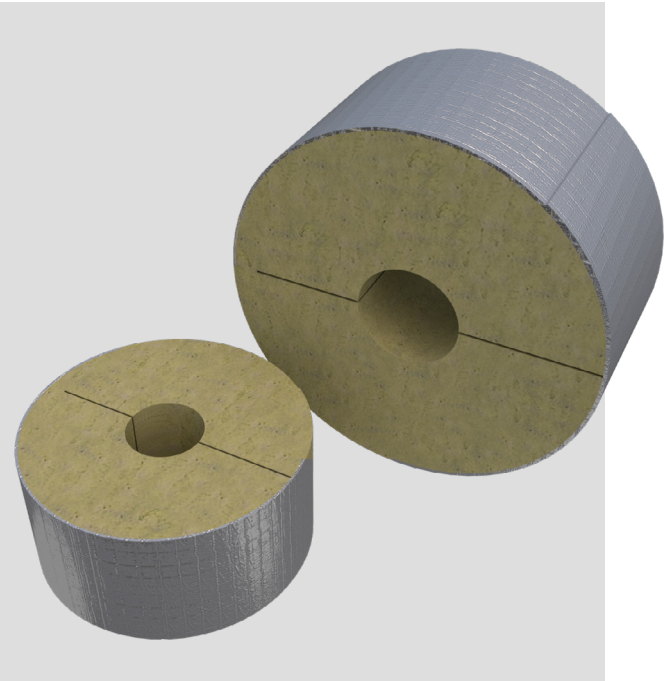
Benefits
▪ Non-combustible, Euroclass A2 <sup>l</sup> -s1, d0 reaction-to-fire classification
▪ Tested to provide up to 120 minutes fire resistance where metal pipes penetrate fire-resisting walls and floors, according to BS EN 1366-3*
▪ CE marked in accordance with BS EN 14303
▪ High density, with proven thermal performance.

*\*Subject to the application*

## RockLap H&V Pipe Supports

A non-combustible, high-density pipe support solution designed to support HVAC pipework and minimise thermal bridging without compromising on combustibility. RockLap H&V Pipe Supports are CE-marked, meeting EU health, safety and environmental guidelines. Fully tested for their compressive strength, RockLap H&V Pipe Supports are suitable for a wide range of sizes including pipes in excess of 205mm diameter.

Benefits
▪ High density CE-marked pipe support product
▪ Non-combustible
▪ Minimises thermal bridging
▪ High compressive strength for effective load bearing capacity



## DuctSlab & DuctWrap

Manufactured from non-combustible stone wool, DuctWrap consists of a lightweight, flexible insulation roll, while DuctSlab is a semi-rigid insulation slab. Both products are faced with a factory-applied reinforced aluminium foil.

DuctSlab and DuctWrap provide thermal insulation for air conditioning, warm air and extractor ducts, located either in plants rooms and boiler houses or externally. They can also be used to thermally insulate cold water storage tanks, feeds and expansion tanks with service temperatures of up to 230°C.

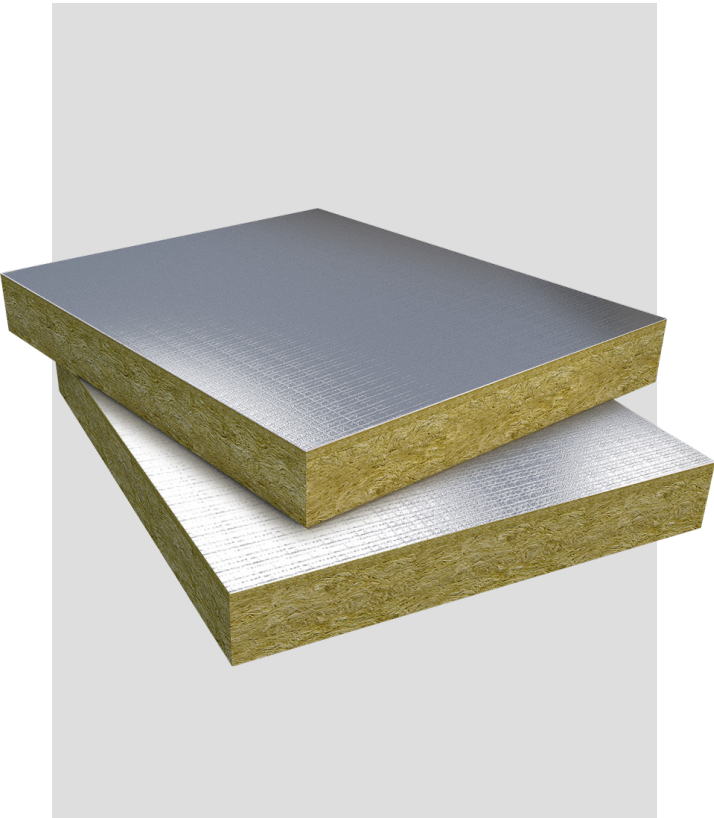
Benefits
▪ CE marked according to EN 14303
▪ Non-combustible, Euroclass A1 reaction-to-fire classification
▪ Water repellent
▪ Chemically inert
▪ Easy to handle and install

## DuoDuct

DuoDuct is a Dual-Density stone wool slab with an aluminium foil facing bonded to the outer surface. The outer layer provides enhanced impact resistance and a suitable substrate for surface applications such as cladding.

Designed for use on rectangular or square external ductwork, ROCKWOOL DuoDuct is suitable for insulating cold air, hot air and dual-purpose duct systems – withstanding service temperatures of up to 230°C.

Benefits
▪ Rated Euroclass A1 non-combustible
▪ Suitable for use with self-adhered external duct membranes
▪ Easy to cut and install
▪ ROCKWOOL Dual Density (DD) technology provides enhanced impact resistance
▪ Sound absorbent



For more information on product specifications, performance and sizing, please visit: [www.rockwool.com/uk/hvac](http://www.rockwool.com/uk/hvac)



BS 5422:2023 thickness tables

Please note that all insulation thicknesses shown are compliant and aligned with commercial availability.

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Table 6:

Minimum insulation thickness for chilled and cold water pipes to control condensation on a high emissivity outer surface (0.9) with an ambient temperature of +25°C and a relative humidity of 80%.

Emissivity = 0.9

Outside diameter of pipe on which insulation thickness has been based (mm)	RockLap H&V Pipe Section (mm)		
	t = 10°C	t = 5°C	t = 0°C
≤17.2	20	20	20
≤21.3	20	20	20
≤26.9	20	20	20
≤33.7	20	20	20
≤42.4	20	20	20
≤48.3	20	20	20
≤60.3	20	20	20
≤76.1	25	25	25
≤88.9	25	25	25
≤101.6	25	25	25
≤114.3	25	25	25
≤139.7	25	25	25
≤168.3	25	25	25
≤219.1	25	25	25
≤244.5	25	25	25
≤273.0	25	25	25
≤323.8	25	25	25
≤355.6	30	30	30

Table 8:

Minimum insulation thickness for chilled and cold water pipes to control condensation on a low emissivity outer surface (0.05) with an ambient temperature of +25°C and a relative humidity of 80%.

Emissivity = 0.05

Outside diameter of pipe on which insulation thickness has been based (mm)	RockLap H&V Pipe Section (mm)		
	t = 10°C	t = 5°C	t = 0°C
≤17.2	20	25	30
≤21.3	20	25	30
≤26.9	20	30	40
≤33.7	20	30	40
≤42.4	20	30	40
≤48.3	25	40	40
≤60.3	25	40	50
≤76.1	25	40	50
≤88.9	30	40	50
≤101.6	30	40	50
≤114.3	30	50	60
≤139.7	40	50	60
≤168.3	40	50	60
≤219.1	40	50	70
≤244.5	40	60	70
≤273.0	40	60	70
≤323.8	40	60	70
≤355.6	40	60	80



Table 10:

Indicative thickness of insulation for cooled and chilled water systems to control heat gain - Low emissivity outer surface.

Emissivity = 0.05

Outside diameter of pipe on which insulation thickness has been based (mm)	RockLap H&V Pipe Section (mm)		
	Cooled water ≥10°C t = 10°C	Chilled water ≥5°C to <10°C t = 5°C	Chilled water 0°C to < 5°C t = 0°C
≤17.2	20	20	25
≤21.3	20	20	25
≤26.9	20	20	25
≤33.7	20	25	30
≤42.4	20	25	30
≤48.3	20	25	30
≤60.3	20	25	30
≤76.1	20	30	40
≤88.9	20	30	40
≤114.3	25	30	40
≤139.7	25	30	40
≤168.3	25	30	40
≤219.1	25	30	40
≤273.0	25	30	40
≥273.0	25	30	40

Table 11:

Indicative thickness of insulation for cooled and chilled water systems to control heat gain - High emissivity outer surface.

Emissivity = 0.90

Outside diameter of pipe on which insulation thickness has been based (mm)	RockLap H&V Pipe Section (mm)		
	Cooled water ≥10°C t = 10°C	Chilled water ≥5°C to <10°C t = 5°C	Chilled water 0°C to < 5°C t = 0°C
≤17.2	20	25	30
≤21.3	20	25	30
≤26.9	25	30	30
≤33.7	25	30	40
≤42.4	25	30	40
≤48.3	25	30	40
≤60.3	25	40	40
≤76.1	30	40	50
≤88.9	30	40	50
≤114.3	30	40	50
≤139.7	30	40	50
≤168.3	30	40	50
≤219.1	30	40	50
≤273.0	30	40	50
≥273.0	30	40	50



Table 12:

Minimum insulation thickness for condensation control on ductwork carrying chilled air in ambient conditions: indoor still air temperature +25°C, relative humidity 80%, dew point temperature 21.3°C.

Minimum air temperature inside duct (°C)	Minimum thickness (mm)					
	DuctSlab			DuctWrap		
	ε = 0.05	ε = 0.44	ε = 0.90	ε = 0.05	ε = 0.44	ε = 0.90
15	25	40	40	25	25	25
10	50	40	40	50	25	25
5	70	40	40	70	40	25
0	90 (50+40)	50	40	90 (50+40)	50	40

Table 13:

Indicative thickness of insulation for ductwork carrying warm air to control heat loss.

Minimum thickness (mm)					
DuctSlab			DuctWrap		
ε = 0.05	ε = 0.44	ε = 0.90	ε = 0.05	ε = 0.44	ε = 0.90
40	40	40	30	40	40

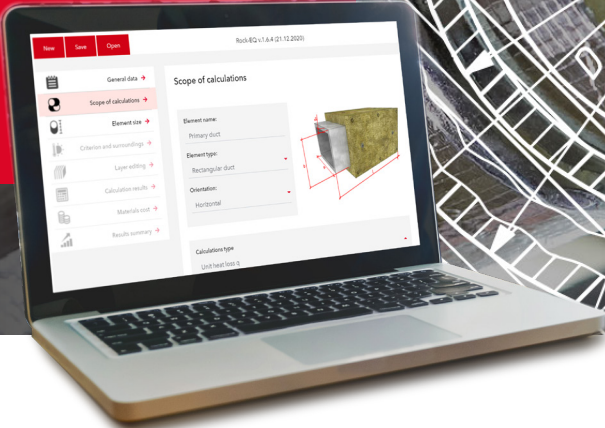
Table 14:

Indicative thickness of insulation for chilled and dual-purpose ducting to control heat transfer.

Minimum thickness (mm)					
DuctSlab			DuctWrap		
ε = 0.05	ε = 0.44	ε = 0.90	ε = 0.05	ε = 0.44	ε = 0.90
50	60	60	50	60	60

# Save time on Building Services & HVAC specification with ROCK-EQ

Specify the right insulation with ROCK-EQ, the building services and HVAC calculation tool from ROCKWOOL.



## A comprehensive report in a few simple steps

The online tool produces detailed, project-specific calculation reports and recommendations from the ROCKWOOL Building Services & HVAC range in a matter of minutes.

ROCK-EQ determines the optimum thickness of insulation to meet specified energy efficiency and generates an in-depth calculation report that's ideal for project specification documentation.

Saving specifiers' time, ROCK-EQ has standard pipe sizes, equipment materials and common claddings already built-in, or specific data can be inputted for non-standard options.

ROCK-EQ can be used to determine insulation thickness for requirements including:

- Condensation control
- Heat gain
- Heat loss
- Personnel protection
- Protection against freezing



## Save time, money and energy

As well as advising the thickness of insulation for maximum energy efficiency in line with BS EN ISO 12241, ROCK-EQ also identifies where specifiers can make financial savings by using a known thickness while still maintaining performance and compliance standards.

The tool shows the energy savings that can be made by insulating equipment and features an estimate for installation works.

Get started with ROCK-EQ at:



rockwool.com/uk/rock-eq





Table 15A:

Base level thickness of insulation for non-domestic heating services to control heat loss - Low emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	Low emissivity outer surface ( $\epsilon = 0.05$ ) Low temperature heating services ( $\leq 95^{\circ}\text{C}$ ) $t = 75^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 17.2$	25
$\leq 21.3$	30
$\leq 26.9$	40
$\leq 33.7$	40
$\leq 42.4$	40
$\leq 48.3$	40
$\leq 60.3$	40
$\leq 76.1$	50
$\leq 88.9$	50
$\leq 114.3$	50
$\leq 139.7$	50
$\leq 168.3$	50
$\leq 219.1$	50
$\leq 273.0$	50
$\geq 273.0$	50

Table 15B:

Enhanced level thickness of insulation for non-domestic heating services to control heat loss - Low emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	Low emissivity outer surface ( $\epsilon = 0.05$ ) Low temperature heating services ( $\leq 95^{\circ}\text{C}$ ) $t = 75^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 17.2$	40
$\leq 21.3$	40
$\leq 26.9$	40
$\leq 33.7$	50
$\leq 42.4$	50
$\leq 48.3$	50
$\leq 60.3$	50
$\leq 76.1$	60
$\leq 88.9$	60
$\leq 114.3$	70
$\leq 139.7$	70
$\leq 168.3$	70
$\leq 219.1$	70
$\leq 273.0$	70
$\geq 273.0$	70



Table 16A:

Base level thickness of insulation for non-domestic heating services to control heat loss - High emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	High emissivity outer surface ( $\epsilon = 0.90$ ) Low temperature heating services ( $\leq 95^{\circ}\text{C}$ ) $t = 75^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 17.2$	30
$\leq 21.3$	40
$\leq 26.9$	40
$\leq 33.7$	40
$\leq 42.4$	40
$\leq 48.3$	50
$\leq 60.3$	50
$\leq 76.1$	50
$\leq 88.9$	50
$\leq 114.3$	60
$\leq 139.7$	60
$\leq 168.3$	60
$\leq 219.1$	60
$\leq 273.0$	60
$\geq 273.0$	60

Table 16B:

Enhanced level thickness of insulation for non-domestic heating services to control heat loss - High emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	High emissivity outer surface ( $\epsilon = 0.90$ ) Low temperature heating services ( $\leq 95^{\circ}\text{C}$ ) $t = 75^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 17.2$	40
$\leq 21.3$	40
$\leq 26.9$	50
$\leq 33.7$	50
$\leq 42.4$	50
$\leq 48.3$	60
$\leq 60.3$	60
$\leq 76.1$	70
$\leq 88.9$	70
$\leq 114.3$	70
$\leq 139.7$	70
$\leq 168.3$	80
$\leq 219.1$	80
$\leq 273.0$	80
$\geq 273.0$	80



Table 17A:

Base level thickness of insulation for non-domestic hot water service areas to control heat loss - Low emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	Low emissivity outer surface ( $\epsilon = 0.05$ ) $t = 60^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 17.2$	25
$\leq 21.3$	25
$\leq 26.9$	30
$\leq 33.7$	30
$\leq 42.4$	30
$\leq 48.3$	40
$\leq 60.3$	40
$\leq 76.1$	40
$\leq 88.9$	40
$\leq 114.3$	40
$\leq 139.7$	40
$\leq 168.3$	40
$\leq 219.1$	40
$\leq 273.0$	50
$\geq 273.0$	50

Table 17B:

Enhanced level thickness of insulation for non-domestic hot water service areas to control heat loss - Low emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	Low emissivity outer surface ( $\epsilon = 0.05$ ) $t = 60^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 17.2$	30
$\leq 21.3$	40
$\leq 26.9$	40
$\leq 33.7$	40
$\leq 42.4$	40
$\leq 48.3$	40
$\leq 60.3$	50
$\leq 76.1$	50
$\leq 88.9$	50
$\leq 114.3$	60
$\leq 139.7$	60
$\leq 168.3$	60
$\leq 219.1$	60
$\leq 273.0$	60
$\geq 273.0$	60



Table 18A:

Base level thickness of insulation for non-domestic hot water service areas to control heat loss - High emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	High emissivity outer surface ( $\epsilon = 0.9$ ) $t = 60^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 17.2$	30
$\leq 21.3$	30
$\leq 26.9$	40
$\leq 33.7$	40
$\leq 42.4$	40
$\leq 48.3$	40
$\leq 60.3$	40
$\leq 76.1$	50
$\leq 88.9$	50
$\leq 114.3$	50
$\leq 139.7$	50
$\leq 168.3$	50
$\leq 219.1$	50
$\leq 273.0$	50
$\geq 273.0$	50

Table 18B:

Enhanced level thickness of insulation for non-domestic hot water service areas to control heat loss - High emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	High emissivity outer surface ( $\epsilon = 0.9$ ) $t = 60^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 17.2$	40
$\leq 21.3$	40
$\leq 26.9$	40
$\leq 33.7$	50
$\leq 42.4$	50
$\leq 48.3$	50
$\leq 60.3$	50
$\leq 76.1$	60
$\leq 88.9$	60
$\leq 114.3$	60
$\leq 139.7$	60
$\leq 168.3$	70
$\leq 219.1$	70
$\leq 273.0$	70
$\geq 273.0$	70



**Table 19A:**  
Base level thickness of insulation for domestic heating and hot water systems having low emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	Low emissivity outer surface ( $\epsilon = 0.05$ ) $t = 60^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 15$	20
$\leq 22$	20
$\leq 28$	20
$\leq 35$	20
$\leq 42$	20
$\leq 54$	20
$\geq 54$	20

**Table 19B:**  
Enhanced level thickness of insulation for domestic heating and hot water systems having low emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	Low emissivity outer surface ( $\epsilon = 0.05$ ) $t = 60^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 15$	20
$\leq 22$	20
$\leq 28$	25
$\leq 35$	25
$\leq 42$	25
$\leq 54$	30
$\geq 54$	30

**Table 19C:**  
Indicative thickness of insulation for district heating systems having low emissivity outer surfaces (secondary system).

Outside diameter of pipe on which insulation thickness has been based (mm)	Low emissivity outer surface ( $\epsilon = 0.05$ ) $t = 55^{\circ}\text{C}$		
	RockLap H&V Pipe Section (mm)	Layers (Diameter x thickness)	
		Inner	Outer
$\leq 21.3$	50	21x50	-
$\leq 26.9$	50	27x50	-
$\leq 33.7$	70	34x70	-
$\leq 42.4$	80	42x80	-
$\leq 48.3$	90	48x90	-
$\leq 60.3$	100	60x100	-
$\leq 76.1$	105	76x70	219x40
$\leq 88.9$	110	89x30	150x80
$\geq 88.9$	110	-	-

**Table 20A:**  
Base level thickness of insulation for domestic heating and hot water systems having high emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	High emissivity outer surface ( $\epsilon = 0.9$ ) $t = 60^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 15$	20
$\leq 22$	20
$\leq 28$	25
$\leq 35$	25
$\leq 42$	25
$\leq 54$	25
$\geq 54$	25



**Table 20B:**  
Enhanced level thickness of insulation for domestic heating and hot water systems having high emissivity outer surfaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	High emissivity outer surface ( $\epsilon = 0.9$ ) $t = 60^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
$\leq 15$	20
$\leq 22$	25
$\leq 28$	30
$\leq 35$	30
$\leq 42$	30
$\leq 54$	40
$\geq 54$	40

**Table 20C:**  
Indicative thickness of insulation for district heating systems having high emissivity outer surfaces (secondary system).

Outside diameter of pipe on which insulation thickness has been based (mm)	Low emissivity outer surface ( $\epsilon = 0.9$ ) $t = 55^{\circ}\text{C}$		
	RockLap H&V Pipe Section (mm)	Layers (Diameter x thickness)	
		Inner	Outer
$\leq 21.3$	50	21x50	-
$\leq 26.9$	60	27x60	-
$\leq 33.7$	80	34x80	-
$\leq 42.4$	80	42x80	-
$\leq 48.3$	100	48x100	-
$\leq 60.3$	100	60x20	102x80
$\leq 76.1$	120	76x70	219x50
$\leq 88.9$	120	89x70	230x50
$\geq 88.9$	120	-	-

**Alternative guidance to BS 5422**  
CIBSE publish a document titled 'CP1 Code of Practice for Heat Networks', in which they specify the insulation requirements shown below.

**CIBSE CP1 3.9.7:**  
Minimum insulation thicknesses for pipework in internal and external spaces.

Outside diameter of pipe on which insulation thickness has been based (mm)	High emissivity outer surface ( $\epsilon = 0.9$ ) $t = 55^{\circ}\text{C}$ RockLap H&V Pipe Section (mm)
20	50
25	50
32	50
40	50
50	60
65	60
80	60



**Table 22:**

Minimum insulation thickness to control the surface temperature of a non-metallic surface with a surface emissivity of 0.90 and design cold face temperature of 59°C.

Emissivity = 0.9

Outside diameter of pipe on which insulation thickness has been based (mm)	RockLap H&V Pipe Section (mm)	
	t = 100°C	t = 200°C
≤17.2	20	20
≤21.3	20	20
≤26.9	20	20
≤33.7	20	20
≤42.4	20	20
≤48.3	20	20
≤60.3	20	20
≤76.1	25	25
≤88.9	25	25
≤101.6	25	25
≤114.3	25	25
≤139.7	25	25
≤168.3	25	25
≤219.1	25	25
≤244.5	25	25
≤273.0	25	25
≤323.8	25	25
≤355.6	30	30

**Table 23:**

Minimum insulation thickness to control the surface temperature of a metallic surface with a surface emissivity of 0.05 and design cold face temperature of 50°C.

Emissivity = 0.05

Outside diameter of pipe on which insulation thickness has been based (mm)	RockLap H&V Pipe Section (mm)	
	t = 100°C	t = 200°C
≤17.2	20	25
≤21.3	20	25
≤26.9	20	25
≤33.7	20	30
≤42.4	20	30
≤48.3	20	40
≤60.3	20	40
≤76.1	25	40
≤88.9	25	40
≤101.6	25	40
≤114.3	25	50
≤139.7	25	50
≤168.3	25	50
≤219.1	25	60
≤244.5	25	60
≤273.0	25	60
≤323.8	25	60
≤355.6	30	60

**Table 24:**

Minimum insulation thickness to control the surface temperature of a non-metallic surface with a surface emissivity of 0.90 and design cold face temperature of 50°C.

**Emissivity = 0.9**

Outside diameter of pipe on which insulation thickness has been based (mm)	RockLap H&V Pipe Section (mm)	
	t = 100°C	t = 200°C
≤17.2	20	20
≤21.3	20	20
≤26.9	20	20
≤33.7	20	20
≤42.4	20	20
≤48.3	20	20
≤60.3	20	20
≤76.1	25	25
≤88.9	25	25
≤101.6	25	25
≤114.3	25	25
≤139.7	25	25
≤168.3	25	25
≤219.1	25	25
≤244.5	25	25
≤273.0	25	25
≤323.8	25	25
≤355.6	30	30

**Table 29:**

Minimum insulation thickness required to give protection against freezing under specified commercial and institutional conditions.

Outside diameter of pipe (mm)	Inside diameter of pipe (bore) (mm)	RockLap H&V Pipe Section (mm)	
		Indoor	Outdoor
Copper pipes			
≥15	13.6	60*	-
≥22	20.2	20	50
≥28	26.2	20	25
≥35	32.6	20	20
≥42	39.6	20	20
≥54	51.6	20	20
≥76.1	73.1	25	25
≥108	105	25	25
*17x20 + 60x40			
Steel pipes			
≥21.3	21.3	40	140*
≥26.9	26.9	20	50
≥33.7	33.7	20	25
≥42.4	42.4	20	20
≥48.3	48.3	20	20
≥60.3	60.3	20	20
≥76.1	76.1	25	25
≥88.9	88.9	25	25
*21x40 + 102x100			



Table 30:

Minimum insulation thickness to protect against freezing - Selected domestic cold water systems (12-hour period).

Outside diameter of pipe (mm)	Inside diameter of pipe (bore) (mm)	RockLap H&V Pipe Section (mm)	
		Inside Building	
		Inside thermal envelope	Inside thermal envelope
Copper pipes			
≥15	13.6	50*	60*
≥22	20.2	20	20
≥28	26.2	20	20
≥35	32.6	20	20
≥42	39.6	20	20
≥54	51.6	20	20
≥76.1	73.1	25	25
≥108	105	25	25
		*17x20 + 60x30	*17x20 + 60x40
Steel pipes			
≥21.3	21.3	40	40
≥26.9	26.9	20	20
≥33.7	33.7	20	20
≥42.4	42.4	20	20
≥48.3	48.3	20	20
≥60.3	60.3	20	20
≥76.1	76.1	25	25
≥88.9	88.9	25	25

Table 31:

Minimum insulation thickness to protect against freezing - Selected domestic cold water systems (8-hour period).

Outside diameter of pipe (mm)	Inside diameter of pipe (bore) (mm)	RockLap H&V Pipe Section (mm)	
		Inside Building	
		Inside thermal envelope	Inside thermal envelope
Copper pipes			
≥15	13.6	25	25
≥22	20.2	20	20
≥28	26.2	20	20
≥35	32.6	20	20
≥42	39.6	20	20
≥54	51.6	20	20
≥76.1	73.1	25	25
≥108	105	25	25
Steel pipes			
≥21.3	21.3	20	20
≥26.9	26.9	20	20
≥33.7	33.7	20	20
≥42.4	42.4	20	20
≥48.3	48.3	20	20
≥60.3	60.3	20	20
≥76.1	76.1	25	25
≥88.9	88.9	25	25

# What is sustainable Building Services & HVAC design?

Energy efficiency and sustainability by design are clear priorities in modern building design, and both passive and active measures are a factor.

Loss of heat from Building Services & HVAC installations results in wasted energy, higher energy costs and increased carbon emissions. This can negatively impact building occupants, building owners and the surrounding environment. Minimising heat gains and losses in pipe systems increases efficiency so heating and cooling processes are not overworked.

A dual approach is recommended to achieve sustainable Building Services & HVAC design. This includes ensuring thermal performance which improves the long-term energy efficiency of a building, but also sustainability by selecting responsible manufacturers and products with proven credentials.

## Our sustainability credentials

ROCKWOOL stone wool insulation delivers against a series of sustainability criteria:

- Net carbon negative, saving over 100 times more energy over the course of its lifetime than was omitted during its production<sup>1</sup>
- Stone wool can be recycled again and again (without degrading its quality)
- Proven to retain its thermal properties for up to 65 years<sup>2</sup>
- Thermal performance, with lambda values as low as 0.032 W/mK, supports energy efficiency and reduces heat gains and losses



- All while maintaining an Euroclass A1 (non-combustible) reaction-to-fire rating:

Euroclass	Combustibility
A1	Non-combustible
A2-s1, d0	
B	Combustible
C	
D	
E	
F	

<sup>1</sup> Energy and carbon emission savings in the lifetime of our sold building insulation and technical insulation products is calculated following methodology developed by Guidehouse, who also validate the annual results. The calculation is based on the principle of ceteris paribus. See <https://www.rockwool.com/group/carbon-impact/#methodology>

<sup>2</sup> Testing conducted at the Danish Technological Institute in 2023 using ROCKWOOL products taken from an external wall system.

To find out more about the sustainability of ROCKWOOL stone wool, and ROCKWOOL as an organisation, please visit:

[rockwool.com/uk/sustainability](https://rockwool.com/uk/sustainability)



## Further Reading

Building Services and HVAC Insulation Resource Hub

[www.rockwool.com/uk/resources-and-tools/resource-hubs/hvac-resource-hub/](https://www.rockwool.com/uk/resources-and-tools/resource-hubs/hvac-resource-hub/)

HVAC Insulation

[www.rockwool.com/uk/products-and-applications/hvac-insulation/](https://www.rockwool.com/uk/products-and-applications/hvac-insulation/)

HVAC Systems Guide

[www.rockwool.com/uk/resources-and-tools/resource-hubs/hvac-resource-hub/#hvacbook](https://www.rockwool.com/uk/resources-and-tools/resource-hubs/hvac-resource-hub/#hvacbook)

Red Book

[www.rockwool.com/uk/redbook](https://www.rockwool.com/uk/redbook)

CPDs

[www.rockwool.com/uk/cpd](https://www.rockwool.com/uk/cpd)





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