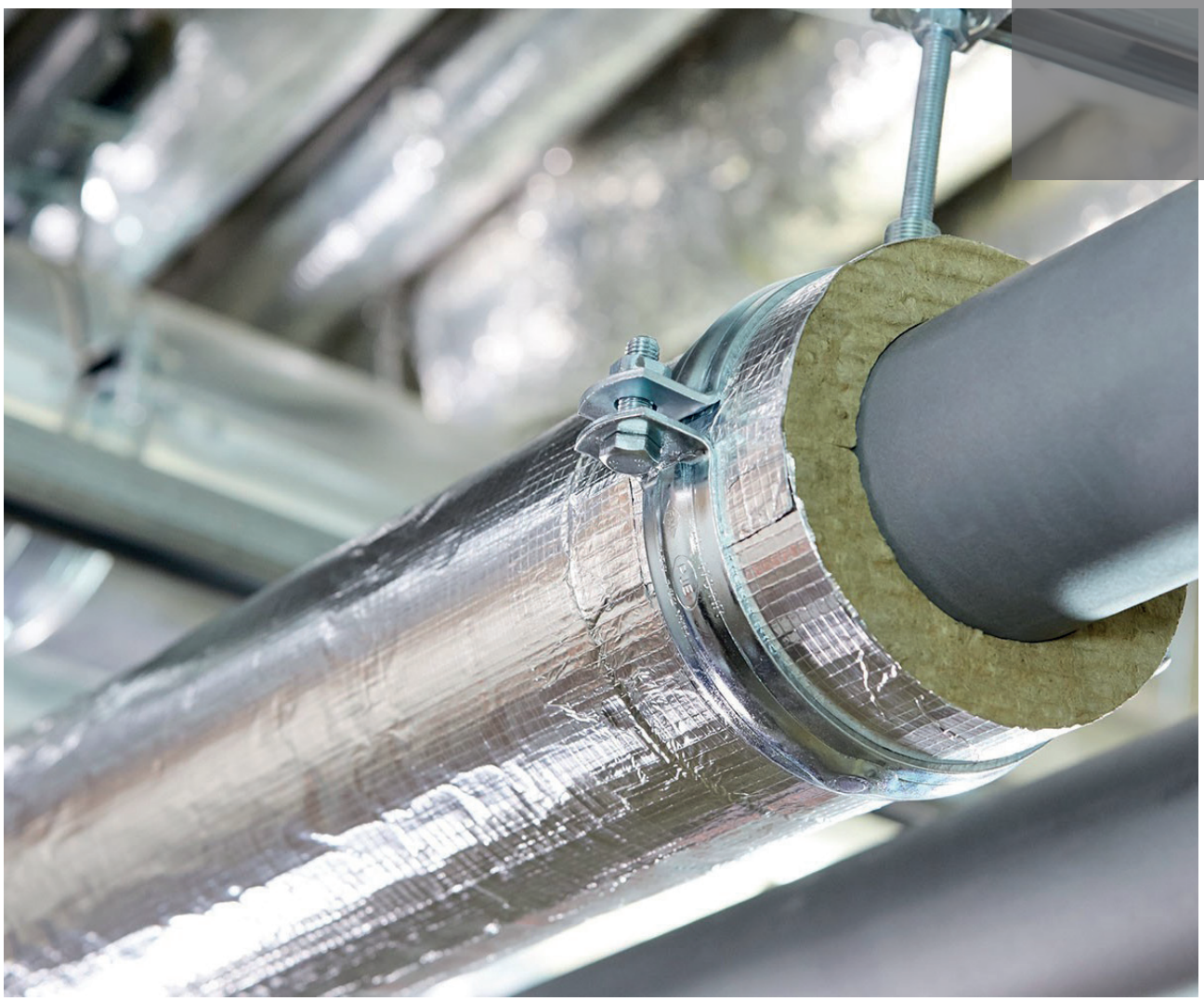
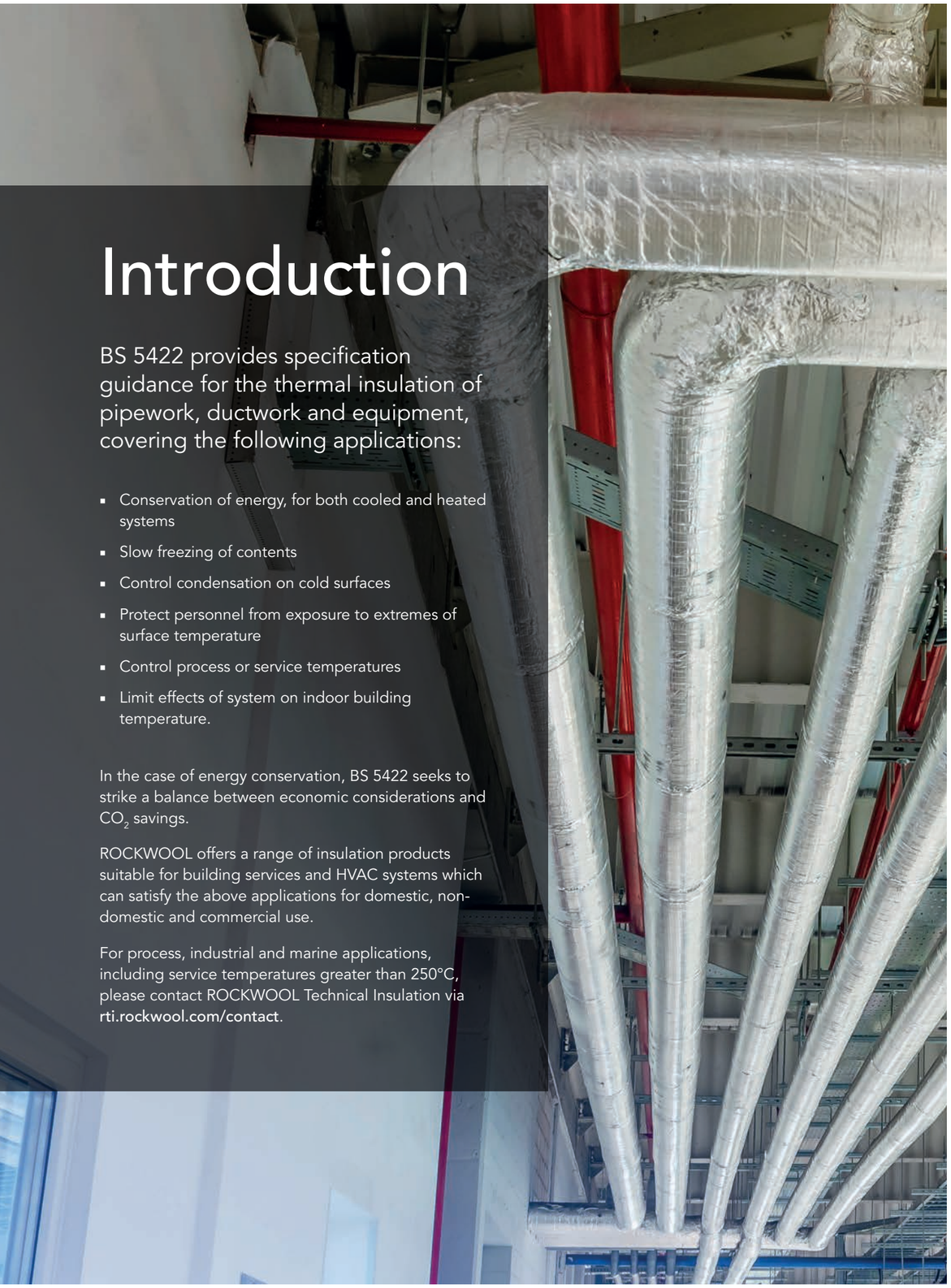
Guide to BS 5422:2023

Thermal insulation of pipework, ductwork and equipment



ROCKWOOL®



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_2 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**.

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 base level performance requirements remain the same as BS 5422:2009, there are a number of changes and additions which 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 takes effect from 30th June 2023, at which point the 2009 version is 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 (λ), 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 for up to 60 years and counting.

"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

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 stable performance.

"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

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.**

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

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[1].

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.**

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.

BS 5422:2023

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.

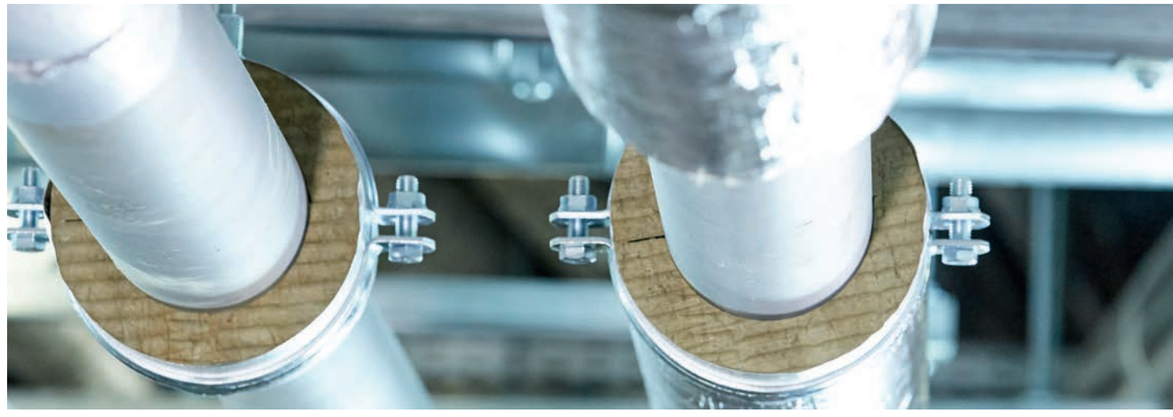
BS 5422:2023

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.

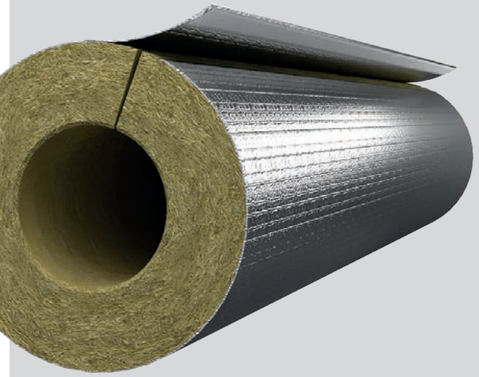
ROCKWOOL stone wool is acoustically absorbent, which helps to reduce noise and dampen vibration.

[1] Total of 'Overcome by gas or smoke' and 'Burns and overcome by gas or smoke', Fire Statistics Table 0504.



Products

The ROCKWOOL HVAC Range comprises a series of solutions which deliver thermal, acoustic and non-combustible performance for 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 quick application and a completely sealed joint.

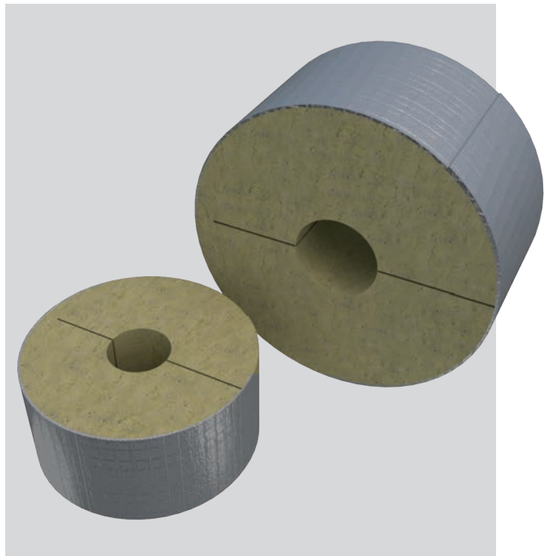
Benefits
▪ Non-combustible, Euroclass A2^{L}-s1, d0 reaction-to-fire classification
▪ Tested to provide up to 120 minutes fire resistance where metal pipes penetrate fire-resisting walls and floors, according to BS EN 1366-3*
▪ CE marked in accordance with BS EN 14303
▪ High density, with proven thermal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

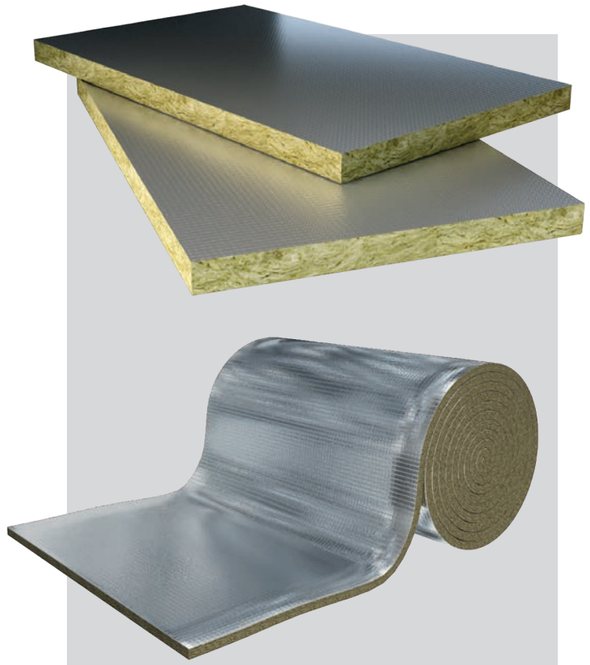
*Subject to the application

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.

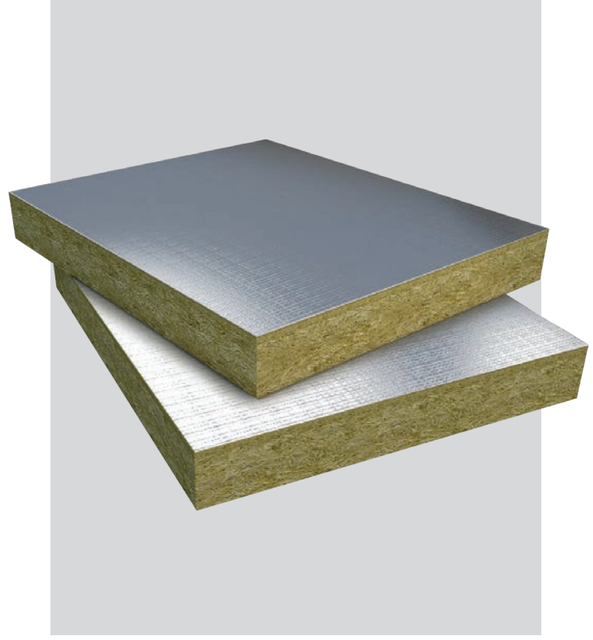
Benefits
▪ CE marked according to EN 14303
▪ Non-combustible, Euroclass A1 reaction-to-fire classification
▪ Water repellent
▪ Chemically inert
▪ Easy to handle and install

DuoDuct

DuoDuct is a Dual-Density stone wool slab with an aluminium foil facing bonded to the outer surface. The robust 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**

BS 5422:2023 thickness tables

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

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
≤406.4	30	30	30
≤457.0	40	40	40
≤508.0	40	40	40
≤559.0	40	40	40
≤610.0	40	40	40

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	35
≤33.7	20	30	35
≤42.4	20	30	40
≤48.3	25	35	40
≤60.3	25	35	50
≤76.1	25	40	50
≤88.9	30	40	50
≤101.6	30	40	50
≤114.3	30	50	60
≤139.7	35	50	60
≤168.3	35	50	60
≤219.1	35	50	70
≤244.5	40	60	70
≤273.0	40	60	70
≤323.8	40	60	70
≤355.6	40	60	80
≤406.4	50	60	80
≤457.0	50	60	80
≤508.0	50	70	80
≤559.0	50	70	80
≤610.0	50	-	-

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	35
≤42.4	25	30	35
≤48.3	25	30	35
≤60.3	25	35	40
≤76.1	30	35	50
≤88.9	30	35	50
≤114.3	30	35	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	40	40	40	40	25	25
10	50	40	40	50	25	25
5	80 (40+40)	40	40	65 (40+25)	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	50	40	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
80 (40+40)	80 (40+40)	80 (40+40)	50	65 (40+25)	65 (40+25)

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 (ε = 0.05) Low temperature heating services (≤ 95°C) *t* = 75°C RockLap H&V Pipe Section (mm)
≤17.2	25
≤21.3	30
≤26.9	35
≤33.7	35
≤42.4	35
≤48.3	40
≤60.3	40
≤76.1	50
≤88.9	50
≤114.3	50
≤139.7	50
≤168.3	50
≤219.1	50
≤273.0	50
≥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 (ε = 0.05) Low temperature heating services (≤ 95°C) *t* = 75°C RockLap H&V Pipe Section (mm)
≤17.2	35
≤21.3	35
≤26.9	40
≤33.7	50
≤42.4	50
≤48.3	50
≤60.3	50
≤76.1	60
≤88.9	60
≤114.3	70
≤139.7	70
≤168.3	70
≤219.1	70
≤273.0	70
≥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 (ε = 0.90) Low temperature heating services (≤ 95°C) *t* = 75°C RockLap H&V Pipe Section (mm)
≤17.2	30
≤21.3	35
≤26.9	40
≤33.7	40
≤42.4	40
≤48.3	50
≤60.3	50
≤76.1	50
≤88.9	50
≤114.3	60
≤139.7	60
≤168.3	60
≤219.1	60
≤273.0	60
≥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 (ε = 0.90) Low temperature heating services (≤ 95°C) *t* = 75°C RockLap H&V Pipe Section (mm)
≤17.2	40
≤21.3	40
≤26.9	50
≤33.7	50
≤42.4	50
≤48.3	60
≤60.3	60
≤76.1	70
≤88.9	70
≤114.3	70
≤139.7	70
≤168.3	80
≤219.1	80
≤273.0	80
≥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 (ε = 0.05) *t* = 60°C RockLap H&V Pipe Section (mm)
≤17.2	25
≤21.3	25
≤26.9	30
≤33.7	30
≤42.4	30
≤48.3	35
≤60.3	35
≤76.1	40
≤88.9	40
≤114.3	40
≤139.7	40
≤168.3	40
≤219.1	40
≤273.0	50
≥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 (ε = 0.05) *t* = 60°C RockLap H&V Pipe Section (mm)
≤17.2	30
≤21.3	35
≤26.9	35
≤33.7	40
≤42.4	40
≤48.3	40
≤60.3	50
≤76.1	50
≤88.9	50
≤114.3	60
≤139.7	60
≤168.3	60
≤219.1	60
≤273.0	60
≥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 (ε = 0.9) *t* = 60°C RockLap H&V Pipe Section (mm)
≤17.2	30
≤21.3	30
≤26.9	35
≤33.7	35
≤42.4	35
≤48.3	40
≤60.3	40
≤76.1	50
≤88.9	50
≤114.3	50
≤139.7	50
≤168.3	50
≤219.1	50
≤273.0	50
≥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 (ε = 0.9) *t* = 60°C RockLap H&V Pipe Section (mm)
≤17.2	35
≤21.3	40
≤26.9	40
≤33.7	50
≤42.4	50
≤48.3	50
≤60.3	50
≤76.1	60
≤88.9	60
≤114.3	60
≤139.7	60
≤168.3	70
≤219.1	70
≤273.0	70
≥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 (ε = 0.05) *t* = 60°C RockLap H&V Pipe Section (mm)
≤15	20
≤22	20
≤28	20
≤35	20
≤42	20
≤54	20
≥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 (ε = 0.05) *t* = 60°C RockLap H&V Pipe Section (mm)
≤15	20
≤22	20
≤28	25
≤35	25
≤42	25
≤54	30
≥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 (ε = 0.05) *t* = 55°C		
	RockLap H&V Pipe Section (mm)	Layers (Diameter x thickness)	
		Inner	Outer
≤21.3	50	21x50	-
≤26.9	50	27x50	-
≤33.7	70	34x70	-
≤42.4	80	42x80	-
≤48.3	90	48x90	-
≤60.3	100	60x100	-
≤76.1	105	76x70	219x35
≤88.9	110	89x30	150x80
≥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 (ε = 0.9) *t* = 60°C RockLap H&V Pipe Section (mm)
≤15	20
≤22	20
≤28	25
≤35	25
≤42	25
≤54	25
≥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 (ε = 0.9) *t* = 60°C RockLap H&V Pipe Section (mm)
≤15	20
≤22	25
≤28	30
≤35	30
≤42	30
≤54	35
≥54	35

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 (ε = 0.9) *t* = 55°C		
	RockLap H&V Pipe Section (mm)	Layers (Diameter x thickness)	
		Inner	Outer
≤21.3	50	21x50	-
≤26.9	60	27x60	-
≤33.7	80	34x80	-
≤42.4	80	42x80	-
≤48.3	100	48x100	-
≤60.3	100	60x20	102x80
≤76.1	120	76x70	219x50
≤88.9	120	89x70	230x50
≥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 (ε = 0.9) *t* = 55°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
≤406.4	30	30
≤457.0	40	40
≤508.0	40	40
≤559.0	40	40
≤610.0	40	40
Flat surfaces	40	40

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	35
≤60.3	20	35
≤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
≤406.4	30	60
≤457.0	40	70
≤508.0	40	70
≤559.0	40	70
≤610.0	40	70
Flat surfaces	40	70

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
≤406.4	30	30
≤457.0	40	40
≤508.0	40	40
≤559.0	40	40
≤610.0	40	40
Flat surfaces	40	40

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	35	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 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 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 truly sustainable 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 CO_2 over the course of its lifetime than was omitted during its production
- 100% recyclable, part of a circular production process which sees old product processed into new insulation
- Proven to retain its insulation properties,including its thermal performance, for over 65 years
- 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	

ROCKWOOL NyRock solutions:* ***www.rockwool.com/uk/nyrock*

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

rockwool.com/uk/sustainability

ROCKWOOL

Further Reading

Building Services and HVAC Insulation Resource Hub
www.rockwool.com/uk/resources-and-tools/resource-hubs/hvac-resource-hub/

HVAC Insulation
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

Red Book
www.rockwool.com/uk/redbook

CPDs
www.rockwool.com/uk/cpd

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