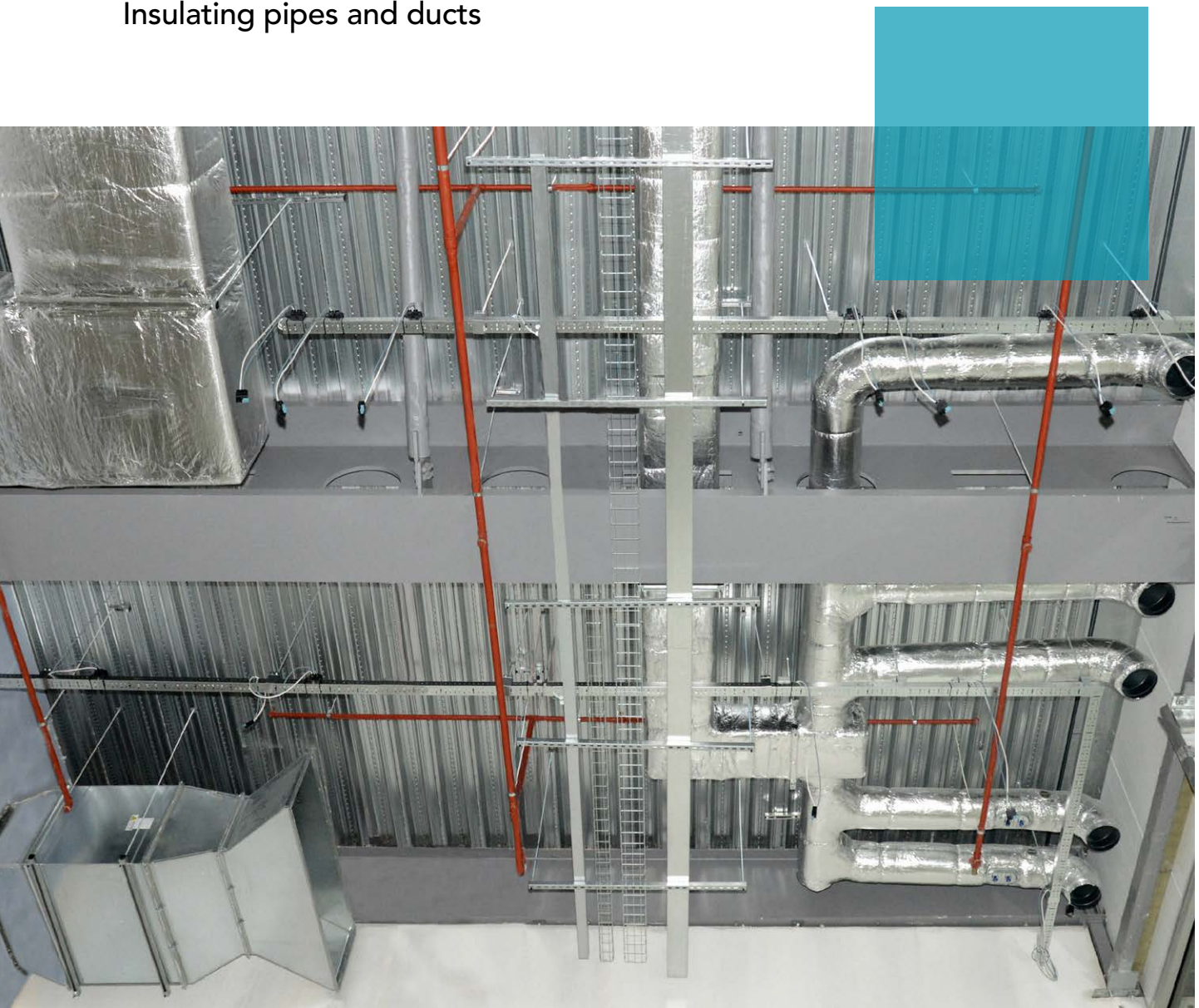


# An Introduction to Part L 2013

Insulating pipes and ducts





# An Introduction to Part L 2013

The insulation of pipes and ducts is essential to minimise heat losses for heated systems and heat gains for cooled systems.

For cooled systems, it is also important to ensure that the risk of condensation is adequately controlled. Guidance on controlling condensation is also provided in this Part L Rockwool guide.

This document is a support document to our publication 'Approved Document L 2013 Edition (England) An Introduction to the Changes' which is available from our website.



# Part L - Insulating pipes and ducts

The new Approved Documents ADL1 and ADL2 rely on 'second-tier' documents published by the department for Communities and Local Government (CLG) to provide detailed information on the minimum provisions necessary to comply with the requirements of the Regulations.

## The Part L second-tier documents for pipe and duct insulation



### **ADL1** Dwellings

The 'Domestic Building Services Compliance Guide, 2013 Edition', provides guidance on the means of complying with requirements for space heating systems and hot water systems in new and existing domestic buildings.



### **ADL2** Buildings other than dwellings

The 'Non-Domestic Building Services Compliance Guide, 2013 Edition', provides guidance on the means of complying with requirements for space heating systems, hot water systems and cooling and ventilation systems in new and existing non-domestic buildings.

# Domestic building services compliance guide

Approved Documents ADL1A and ADL1B rely on 'second tier' documents to provide detailed information on the minimum provisions necessary to comply with the requirements of the Regulations.

The Domestic Building Services Compliance Guide (2013 Edition) is a second tier document providing guidance on the means of complying with the requirements for space heating systems and hot water systems.

## Minimum provisions for insulation of pipes

The minimum provisions shown below for the insulation of pipes are repeated in the Domestic Building Services Compliance Guide (2013 Edition) for fuel types and heating systems as follows;

- Gas-fired primary and secondary space heating and hot water
- Oil-fired primary and secondary space heating and hot water
- Electric primary and secondary space heating and hot water
- Solid-fuel primary and secondary space heating and hot water
- Community heating
- Solar water heating

## Minimum provision for insulation of new system pipes

In new systems pipes should, in the following cases, be insulated with insulation complying with the requirements of the Domestic Building Services Compliance Guide (2013 Edition) (in line with the maximum permissible heat loss indicated in the Supplementary Information column), and labelled accordingly:

- Primary circulation pipes for heating and hot water circuits should be insulated wherever they pass outside the heated living space or through voids which communicate with and are ventilated from unheated spaces
- Primary circulation pipes for domestic hot water circuits should be insulated throughout their length, subject only to practical constraints imposed by the need to penetrate joists and other structural elements
- All pipes connected to hot water storage vessels, including the vent pipe, should be insulated for at least 1m from their points of connection to the cylinder (or they should be insulated up to the point where they become concealed)
- If secondary circulation is used, all pipes kept hot by that circulation should be insulated

For replacement systems, whenever a boiler or hot water storage vessel is replaced in an existing system, any pipes (in the situations above) that are exposed as part of the work or are otherwise accessible should be insulated with insulation complying with the requirements of the Domestic Building Services Compliance Guide (2013 Edition) and labelled accordingly – or to some lesser standard where practical constraints dictate.



## Supplementary information

Insulation for pipework in unheated areas

Extra provision may need to be made to protect central heating and hot water pipework in unheated areas against freezing. Further guidance is available in:

- BS 5422:2009 Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range of  $-40^{\circ}\text{C}$  to  $+700^{\circ}\text{C}$
- BRE Report No 262 Thermal insulation: avoiding risks, 2002 edition

Where insulation is labelled as complying with the Domestic Building Services Compliance Guide (2013 Edition) it must not exceed the following heat loss levels:

**Table 1**

Based on Tables 19, BS5422:2009 Indicative thickness of insulation for domestic heating and hot water systems having low emissivity outer surfaces

Outside diameter of steel pipe on which insulation thickness has been based (mm)	Thickness of ROCKWOOL RockLap H&V Pipe Section (mm)		
	Calculated thickness (mm)	Advised thickness (mm)	Heat loss (W/m)
8	8	20	7.06
10	10	20	7.23
12	13	20	7.35
15	14	20	7.89
22	17	20	9.12
28	19	20	10.07
35	20	20	11.08
42	21	25	12.19
54	22	25	14.12

**Table 2**

Based on Tables 20, BS5422:2009 Indicative thickness of insulation for domestic heating and hot water systems having high emissivity outer surfaces

Outside diameter of steel pipe on which insulation thickness has been based (mm)	Thickness of ROCKWOOL RockLap H&V Pipe Section (mm)		
	Calculated thickness (mm)	Advised thickness (mm)	Heat loss (W/m)
8	11	20	7.06
10	13	20	7.23
12	16	20	7.35
15	18	20	7.89
22	21	25	9.12
28	23	25	10.07
35	24	25	11.08
42	25	25	12.19
54	27	30	14.12

Insulation thicknesses in this table have been calculated according to BS EN ISO 12241:1998 using standardized assumptions: horizontal pipe at  $60^{\circ}\text{C}$  in still air at  $15^{\circ}\text{C}$ , emissivity of outer surface of insulated system as specified. Heat loss relates to the specified thickness and temperature. This table is applicable to pipes serving solar hot water panels.

# Non-domestic building services compliance guide

## Pipework and duct insulation

Approved Documents ADL2A and ADL2B (2013 Edition) rely on 'second-tier' documents to provide detailed information on the minimum provisions necessary to comply with the requirements of the Regulations.

The 'Non-Domestic Building Services Compliance Guide (2013 Edition)' is a second-tier document providing guidance on the means of complying with the requirements for space heating systems, hot water systems, cooling and ventilation systems.

Section 11 of the Non-Domestic Building Services Compliance Guide outlines the minimum provisions needed to comply with ADL2A and ADL2B when insulating pipes and ducts serving space heating, hot water and cooling systems in new-build and in existing buildings.

The insulation of pipes and ducts is essential to minimise heat losses for heated systems and heat gains for cooled systems. For cooled systems, it is also important to ensure that the risk of condensation is adequately controlled. Although not within the scope of the Non-Domestic Building Services Compliance Guide, guidance on controlling condensation is also provided:

- A** Direct hot water pipes and low, medium and high temperature heating pipes
- B** Cooled water supply pipes
- C** Heated air ducts, cooled air ducts and dual-purpose heated and cooled air ducts
- D** Condensation control





## A Direct hot water and heating pipework

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 that 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 un-insulated pipes should only be permitted where the heat can be demonstrated as 'always useful'. In order to demonstrate compliance the maximum permissible heat losses for different pipe sizes and temperatures, as given in the table below should not be exceeded.

**Table 2**

Based on Tables 16 and 18, BS5422:2009 Maximum permissible heat loss (W/m) for direct hot water and heating pipes.

Outside diameter of steel pipe on which insulation thickness has been based (mm)	Thickness of ROCKWOOL RockLap H&V Pipe Section (mm)											
	Hot water <sup>1</sup>			Low temp heating <sup>2</sup> 75°C			Medium temp heating <sup>3</sup> 100°C			High temp heating <sup>4</sup> 125°C		
	Calculated thickness (mm)	Advised thickness (mm)	Heat loss (W/m)	Calculated thickness (mm)	Advised thickness (mm)	Heat loss (W/m)	Calculated thickness (mm)	Advised thickness (mm)	Heat loss (W/m)	Calculated thickness (mm)	Advised thickness (mm)	Heat loss (W/m)
17.2	31	35	6.6	32	35	8.9	32	35	13.34	32	35	17.92
21.3	33	35	7.13	37	40	9.28	39	40	13.56	39	40	18.32
26.9	35	35	7.83	40	40	10.06	47	50	13.83	48	50	18.7
33.7	37	40	8.62	42	45	11.07	55	55	14.39	59	60	19.02
42.4	38	40	9.72	44	45	12.3	60	60	15.66	73	75	19.25
48.3	40	40	10.21	47	50	12.94	61	65	16.67	76	80	20.17
60.3	42	45	11.57	49	50	14.45	65	65	18.25	81	85	21.96
76.1	44	45	13.09	51	55	16.35	68	70	20.42	86	90	24.21
88.9	44	45	14.58	52	55	17.91	70	70	22.09	90	90	25.99
114.3	45	45	17.2	54	55	20.77	74	75	25.31	95	95	29.32
139.7	46	50	19.65	55	55	23.71	77	80	28.23	99	100	32.47
168.3	47	50	22.31	57	60	26.89	79	80	31.61	102	105	36.04
219.1	48	50	27.52	58	60	32.54	81	85	37.66	107	110	42.16
273	49	50	32.4	58	60	38.83	84	90	43.72	110	110	48.48

NOTES 1, 2, 3, 4 To ensure compliance with maximum permissible heat loss criteria, proposed insulation thicknesses should be calculated according to BS EN ISO 12241 using standardised assumptions:

<sup>1</sup> Horizontal pipe at 60°C in still air at 15°C

<sup>2</sup> Horizontal pipe at 75°C in still air at 15°C

<sup>3</sup> Horizontal pipe at 100°C in still air at 15°C

<sup>4</sup> Horizontal pipe at 125°C in still air at 15°C

All the figures above are based on a high emissivity outer surface (0.09) Due to 'rounding up' to the nearest commercially available thickness, the thermal performance required will be met or exceeded.

## B Cooled pipework

Cooled pipework should be insulated along its whole length in order to provide the necessary means of limiting heat gain. Control should be maximised and heat gain to uninsulated pipes should only be permitted where the proportion of the cooling load relating to distribution pipework is proven to be less than 5% of total load. In order to demonstrate compliance, the maximum permissible heat gain for different pipe sizes and temperatures, as given in the table below, should not be exceeded.

**Table 3**

Based on Table 10, BS5422:2009 Maximum permissible heat gain for cooled water supplies.

Outside diameter of steel pipe on which insulation thickness has been based (mm)	Temperature of contents (°C)								
	Thickness of ROCKWOOL RockLap H&V Pipe Section (mm)								
	Temperature of contents <sup>5</sup> +10°C			Temperature of contents <sup>6</sup> +5°C			Temperature of contents <sup>7</sup> 0°C		
	Calculated thickness (mm)	Advised thickness (mm)	Heat loss (W/m)	Calculated thickness (mm)	Advised thickness (mm)	Heat loss (W/m)	Calculated thickness (mm)	Advised thickness (mm)	Heat loss (W/m)
17.2	13	20	2.48	18	20	2.97	21	25	3.47
21.3	15	20	2.72	19	20	3.27	22	25	3.81
26.9	15	20	3.05	21	25	3.58	24	25	4.18
33.7	17	20	3.41	22	25	4.01	26	30	4.6
42.4	18	20	3.86	23	25	4.53	28	30	5.11
48.3	18	20	4.11	24	25	4.82	29	30	5.45
60.3	19	20	4.78	25	30	5.48	30	35	6.17
76.1	20	20	5.51	26	30	6.3	35	35	6.7
88.9	20	20	6.17	27	30	6.9	33	35	7.77
114.3	21	25	7.28	27	30	8.31	34	35	9.15
139.7	21	25	8.52	28	30	9.49	35	35	10.45
168.3	21	25	9.89	28	30	10.97	36	40	11.86
219.1	21	25	12.27	29	30	13.57	36	40	14.61
273	21	25	14.74	29	30	16.28	36	40	17.48

**NOTE 1** - Insulation thicknesses in this table have been calculated according to BS EN ISO 12241:2008 using standardised assumptions: horizontal pipe in still air at 25°C, emissivity of outer surface of insulated system as specified.

**NOTE 2** - Thicknesses derived solely against the criteria noted in this table may not necessarily satisfy other design requirements such as control of condensation.

**NOTE 3** - Heat gain relates to the specified thickness and temperature.



## c Hot and cooled ducting

Ducting should be insulated along its whole length in order to provide the necessary means of limiting heat gains and/or heat losses from ducts. Where ducting may be used for both heating and cooling duties at different periods during its lifecycle, the provisions for chilled ducting should be adopted, since these are the most onerous. The table below indicates the maximum heat gain/loss per unit area required to meet these provisions (heat gains are shown as negative values). As with pipes, additional insulation may be required to provide adequate condensation control. Further details regarding these specific requirements are given in the TIMSA HVAC Guide.

**Table 4**

Based on Tables 13 and 14, BS5422:2009 Maximum permissible heat gain/loss for insulated ducts used to carry cooled air (including those heated ducts used periodically for cooled air).

Thicknesses given are calculated specifically against the criteria noted in the table. Adopting these thicknesses may not necessarily satisfy other design requirements such as control of condensation. Additional guidance on the control of condensation is provided in Table 5 of this ROCKWOOL Guide.

<sup>8</sup> and <sup>9</sup> To ensure compliance with maximum permissible heat transfer criteria, proposed insulation thicknesses should be calculated according to BS EN ISO 12241 using standardized assumptions:

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

Max Heat Loss (W/m <sup>2</sup> )	External surface emissivity Minimum thickness of ROCKWOOL Ductwrap (mm)					
	0.05 (eg bright aluminium foil)		0.44 (eg dusty galvanised steel)		0.9 (eg black paint)	
	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)
16.34	31	40	36	40	39	40

Max Heat Loss (W/m <sup>2</sup> )	External surface emissivity Minimum thickness of ROCKWOOL Ductsab (mm)					
	0.05 (eg bright aluminium foil)		0.44 (eg dusty galvanised steel)		0.9 (eg black paint)	
	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)
16.34	32	40	37	40	40	50

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

Max Heat Loss (W/m <sup>2</sup> )	External surface emissivity Minimum thickness of ROCKWOOL Ductwrap (mm)					
	0.05 (eg bright aluminium foil)		0.44 (eg dusty galvanised steel)		0.9 (eg black paint)	
	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)
6.45	50	50	57	60	60	65

Max Heat Loss (W/m <sup>2</sup> )	External surface emissivity Minimum thickness of ROCKWOOL Ductsab (mm)					
	0.05 (eg bright aluminium foil)		0.44 (eg dusty galvanised steel)		0.9 (eg black paint)	
	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)
6.45	51	60	59	60	62	70

<sup>8</sup> Horizontal duct at 35°C, with 600mm vertical sidewall in still air at 15°C

<sup>9</sup> Horizontal duct at 13°C, with 600mm vertical sidewall in still air at 25°C

All the figures above are based on a low emissivity outer surface (0.05)

Due to 'rounding up' to the nearest commercially available thickness, the thermal performance required will be met or exceeded.

## D Condensation control: Chilled and cold water pipes

**Table 5**

Based on Table 8, BS5422:2009 Minimum insulation thickness for chilled and cold water steel 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%

Outside diameter of steel pipe on which insulation thickness has been based (mm)	Temperature of contents (°C)					
	Thickness of ROCKWOOL RockLap H&V Pipe Section (mm)					
	Temperature of Contents +10°C		Temperature of Contents +5°C		Temperature of Contents 0°C	
	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)	Calculated thickness (mm)	Advised thickness (mm)
17	16	20	22	25	28	30
21	17	20	24	25	30	35
27	19	20	26	30	33	35
33	20	25	27	30	35	35
42	21	25	30	30	37	40
48	22	25	31	35	39	40
60	24	25	33	35	42	45
76	26	30	36	40	44	45
89	27	30	37	40	47	50
102	28	30	39	40	49	50
114	29	30	40	40	51	55
140	31	35	42	45	53	55
169	32	35	45	45	57	60
219	34	35	48	50	61	65
245	36	40	50	50	63	65
273	37	40	51	55	65	65
324	38	40	53	55	68	70
356	39	40	54	55	70	70
406	40	45	56	60	72	75
456	41	45	58	60	75	75
508	42	45	60	60	77	80
558	44	45	61	65	78	80
610	45	45	63	70	80	90

Thicknesses given are calculated specifically against the criteria noted in the table

These thicknesses may not satisfy other design requirements. In situations where the ambient air temperature is greater than 25°C and/or the relative humidity exceeds 80%, these thicknesses will not be sufficient to control condensation.

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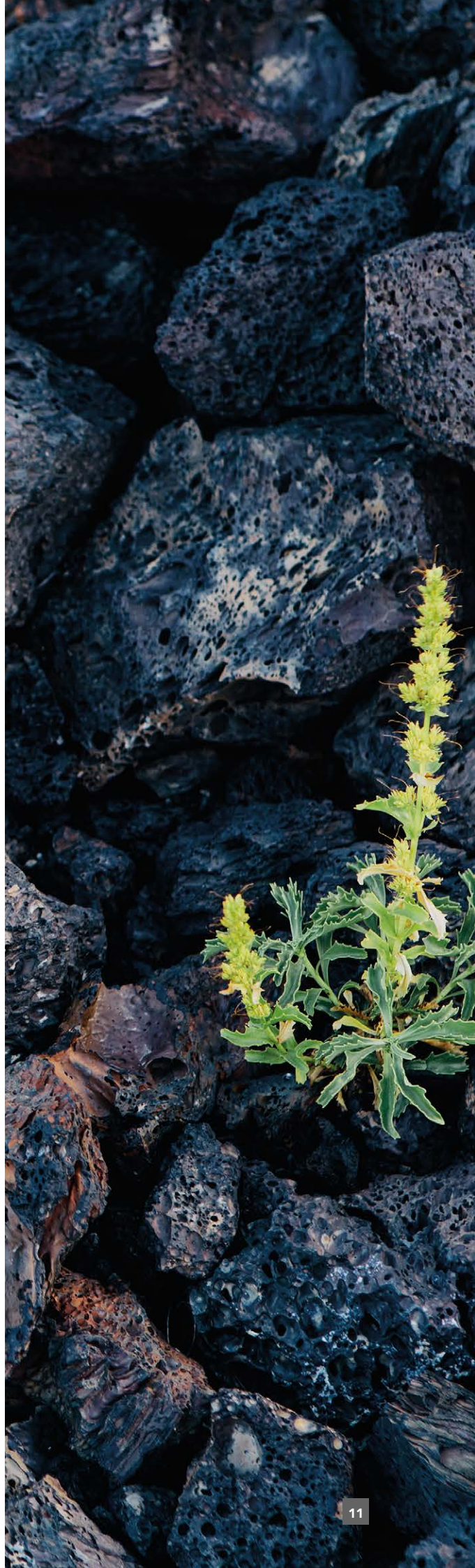
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