Essential Cold Weather Maintenance

Maximising Efficiencies

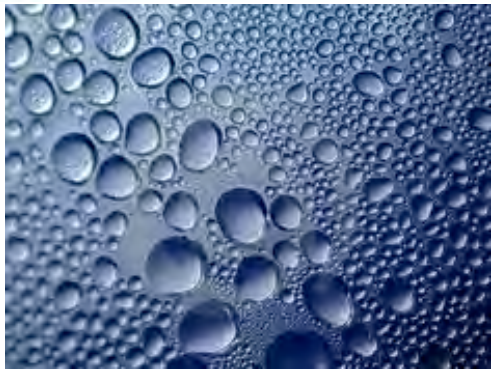
Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

Essential Cold Weather Maintenance

Maximising Efficiencies



Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

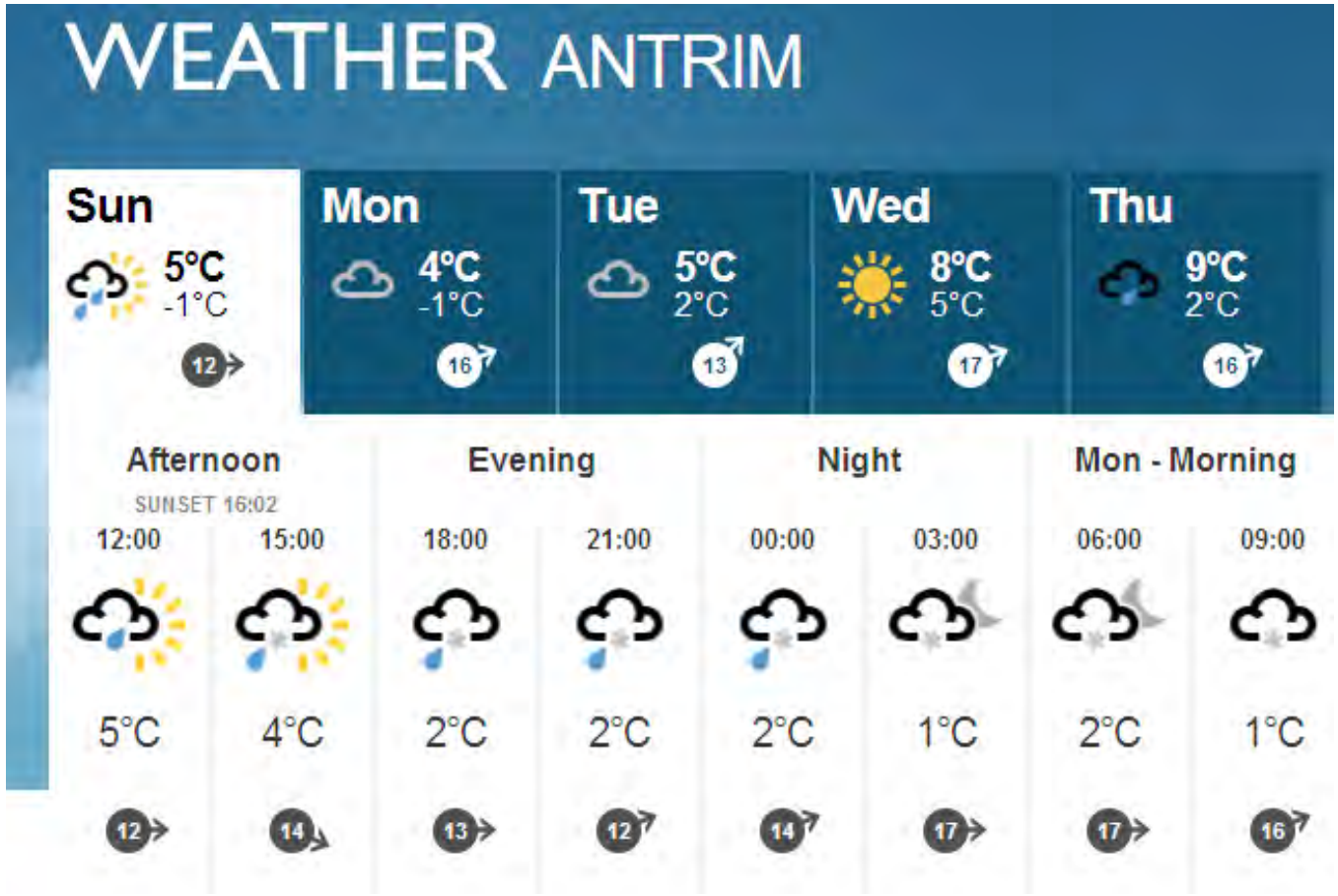
Procedures

Maximising Efficiencies

- Establish a "weather watch" with written procedures for alerting management and maintenance personnel
  - What to do
  - Who to call
  - When to call them
- Arrange for maintenance personnel to be available during expected cold snaps
- Include specific checks for adequate cold weather protection in written equipment maintenance procedures
- Develop procedures for repairing or replacing damaged equipment and safely restoring it to service

Weather Forecast

Maximising Efficiencies



Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

Weather Forecast

Maximising Efficiencies

"…a colder than average winter is the most likely scenario … but not as extreme or long lived as last year"

Paul Hudson, BBC Weather

Weather Forecast

Maximising Efficiencies

- www.metoffice.gov.uk/weather/uk/coldweatheralert
- www.metoffice.gov.uk/weather/uk/ni/ni_forecast_warnings.html

Met Office

Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

Stopcock

Maximising Efficiencies

- Do you know where your stopcock is?
- When was the last time you tried to turn it?
- Would it work in an emergency?
- Sure Stop

Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

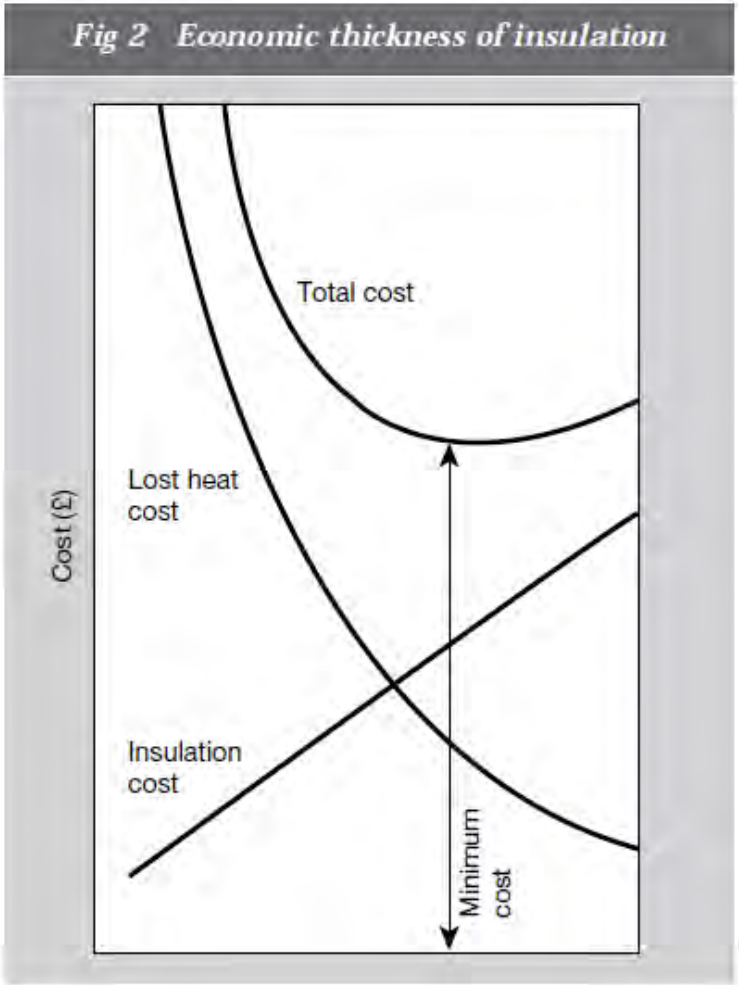
Temperatures

Maximising Efficiencies

- Comfort
  21°C to 23°C
- Fabric Protection
  10°C to 12°C
- Frost Protection
  2°C to 5°C

Insulation

Maximising Efficiencies



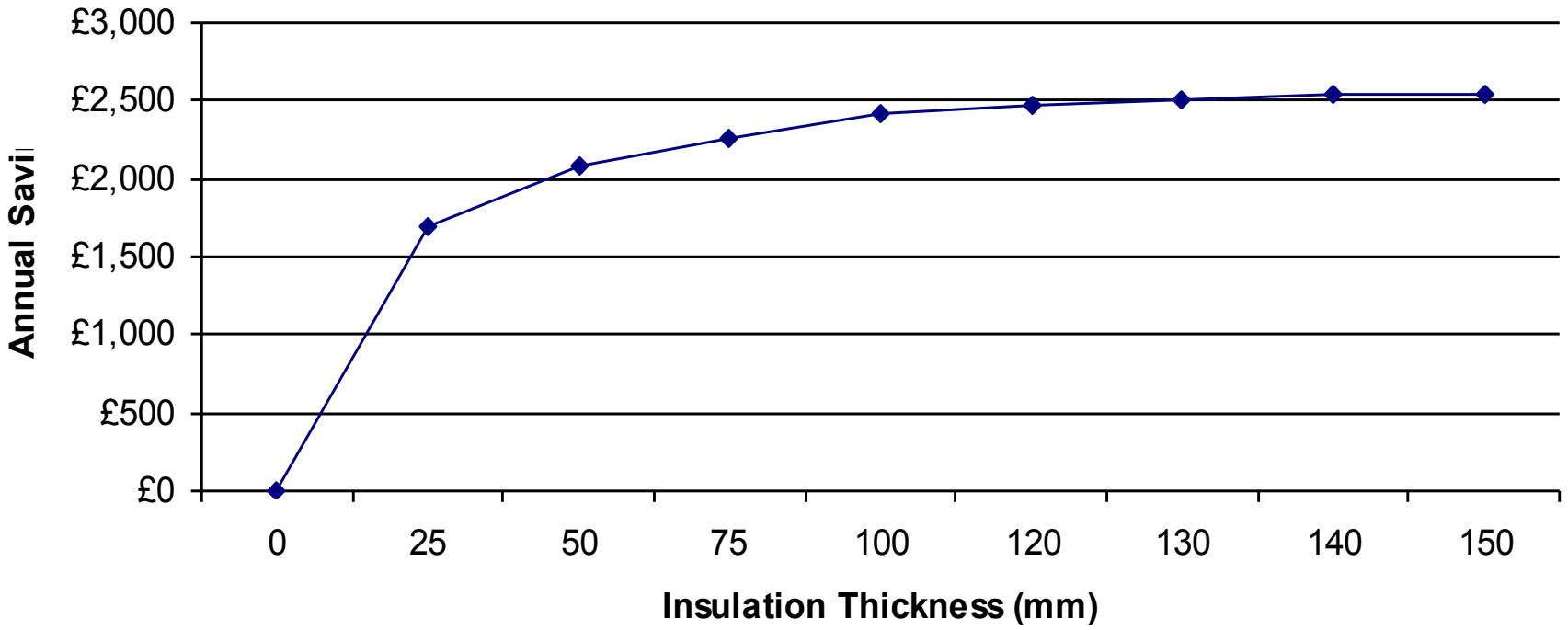
Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

Insulation

Maximising Efficiencies



Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

Insulation

Maximising Efficiencies

Table 1 The Payback Period for Insulation on Domestic Central Heating Pipework	
Number of Operating Hours	*Payback Period (Years)*
1000	2
2000	1
3000	0.7
4000	0.5

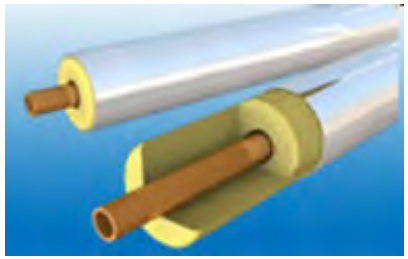
Insulation

Maximising Efficiencies

- Loft Insulation – 200 mm
  - 2 year payback

- Infiltration
  - Doors, windows, services, vents

- Hot pipework insulation
  - 1 year payback



Insulation

Maximising Efficiencies

- Economic Thickness of Insulation
  - Carbon Trust FEB008
  - Need to register to download
- Environmental Thickness of Insulation
  - TIMSA HVAC Guidance
  - http://timsa.associationhouse.org.uk/default.php?cmd=215&doc_id=634
  - Need to register to download

Insulation - Hot Water

Maximising Efficiencies

Indicative thickness of insulation for non-domestic hot water service areas to control heat loss

Outside diameter of pipe on which insulation thickness has been based mm	Water temperature of 60 °C; ambient temperature 15°C							
	Thermal conductivity at insulation mean temperature W/(m-K) (low emissivity facing: 0.05)							Maximum Permissible Heat loss
	0.025	0.030	0.035	0.040	0.045	0.050	0.055	
	Thickness of insulation mm							W/m
17.2	12	17	23	31	41	53	69	6.60
21.3	14	19	25	33	43	55	70	7.13
26.9	15	21	27	35	45	57	71	7.83
33.7	17	22	29	37	47	58	72	8.62
42.4	18	23	30	38	47	57	70	9.72
48.3	19	25	32	40	49	60	73	10.21
60.3	20	26	33	41	50	60	71	11.57
76.1	22	28	35	43	52	61	72	13.09
88.9	22	28	35	43	51	60	70	14.58
114.3	23	29	36	43	51	60	69	17.20
139.7	24	31	37	44	52	60	69	19.65
168.3	25	32	38	45	53	61	70	22.31
219.1	26	32	38	45	52	60	68	27.52
273.0 and above	27	33	39	46	53	60	68	32.40

Insulation - Wet Heating

Maximising Efficiencies

Indicative thickness of insulation for non-domestic low temperature heating service areas to control heat loss								
Outside diameter of pipe on which insulation thickness has been based mm	Water temperature of 75 °C; Ambient temperature 15°C							
	Thermal conductivity at insulation mean temperature W/(m·K) (low emissivity facing: 0.05)							Maximum permissible Heat loss
	0.025	0.030	0.035	0.040	0.045	0.050	0.055	
	Thickness of insulation mm							W/m
17.2	12	17	22	30	39	51	66	8.90
21.3	14	20	26	35	46	59	75	9.28
26.9	16	22	29	38	49	62	78	10.06
33.7	18	24	31	40	51	64	79	11.07
42.4	20	26	33	42	52	65	79	12.30
48.3	21	27	35	44	55	67	82	12.94
60.3	23	29	37	46	56	68	82	14.45
76.1	24	31	39	48	58	70	83	16.35
88.9	25	32	40	49	59	70	82	17.91
114.3	27	34	42	51	61	71	83	20.77
139.7	28	35	43	52	61	71	82	23.71
168.3	29	37	44	53	62	72	82	26.89
219.1	30	38	45	54	62	72	82	32.54
273.0 and above	31	38	46	54	62	71	80	38.83

Insulation - Chilled Water

Maximising Efficiencies

Indicative thickness of insulation for cooled water systems to control heat gain

Outside diameter of pipe on which insulation thickness has been based mm	Water temperatures of 10 °C for chilled water with ambient still air temperatures of 25 °C (low emissivity facing: 0.05)					
	Thermal conductivity at 15 °C W/(m-K)					Maximum Permissible Heat gain
	0.020	0.025	0.030	0.035	0.040	
	Thickness of insulation (mm)					W/m
17.2	6	8	11	15	20	2.48
21.3	7	9	12	16	21	2.72
26.9	7	10	13	17	22	3.05
33.7	8	11	14	18	23	3.41
42.4	9	12	15	19	24	3.86
48.3	9	13	16	20	25	4.11
60.3	10	13	16	20	25	4.78
76.1	11	14	17	21	26	5.51
88.9	11	14	18	21	26	6.17
114.3	12	15	19	22	27	7.28
139.7	12	15	19	22	27	8.52
168.3	12	15	19	22	26	9.89
219.1	12	15	19	22	26	12.27
273.0 and above	12	16	19	22	26	14.74

Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

Insulation - Cold Water

Maximising Efficiencies

- Pipework cannot be protected indefinitely from freezing by insulation.
- After sufficient passage of time, the temperature of the water in a pipe will equilibrate with the outside ambient conditions.
- Accordingly, protection is usually quoted in terms of the time afforded before freezing takes place.

Insulation - Cold Water

Maximising Efficiencies

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

Outside diameter (mm)	Inside diameter (bore) (mm)	Thickness of insulation (mm)									
		Specified conditions 1					Specified conditions 2				
		λ = 0.020	λ = 0.025	λ = 0.030	λ = 0.035	λ = 0.040	λ = 0.020	λ = 0.025	λ = 0.030	λ = 0.035	λ = 0.040
Copper pipes [1]											
15.0	13.6	23	35	53	78	113	68	126	229	413	740
22.0	20.2	10	14	18	23	28	21	30	42	58	78
28.0	26.2	7	9	11	13	16	13	17	22	28	35
35.0	32.6	5	7	8	10	11	9	12	15	18	22
42.0	39.6	4	5	6	7	9	7	9	11	13	16
54.0	51.6	3	4	5	5	6	5	7	8	9	11
76.1	73.1	2	3	3	4	4	4	5	5	6	7
108.0	105.0	2	2	2	3	3	3	3	4	4	5
Steel pipes [2]											
21.3	16.0	18	26	35	48	64	44	71	112	173	265
26.9	21.6	10	13	17	21	26	20	28	39	52	68
33.7	27.2	7	9	12	14	17	13	18	23	29	36
42.4	35.9	5	6	8	9	11	9	11	14	17	20
48.3	41.8	4	5	6	7	9	7	9	11	13	16
60.3	53.0	3	4	5	6	7	5	7	8	10	11
76.1	68.8	3	3	4	4	5	4	5	6	7	8
88.9	80.8	2	3	3	4	4	3	4	5	6	7

Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

Insulation

Maximising Efficiencies

- Carbon Trust
  - The Economic Thickness of Insulation for Hot Pipes (FEB008)
  - How to implement roof insulation (CTL064)
  - How to implement thermal insulation to HVAC services (CTL145)
  - Energy management case study - Scotland - Mabbett & Associates Ltd (CTS051)
  - Buildings case study - Montgomery Property Developments Ltd, Carnbooth House Hotel, Glasgow - Low carbon refurbishment of a listed building (CTS247)

Draught Proofing

Maximising Efficiencies

- Where?
  - Doors
  - Windows
  - Services
  - Fire places
  - Floor boards

Doors

Maximising Efficiencies

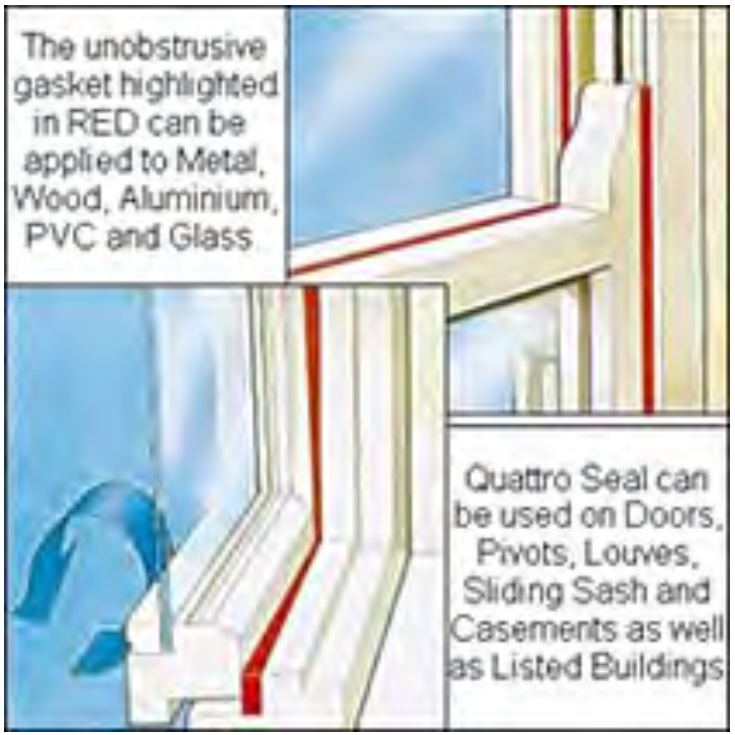
- Letterbox brush

- Door Strips

- Bottom

Windows

Maximising Efficiencies



www.quattroseal.com
www.reddiseals.com
www.schlegel.com

Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

Chimney Balloon

Maximising Efficiencies

Invest Northern Ireland
Building Locally
Competing Globally

Mabbett™

European Union
European Regional Development Fund

Condensation

Maximising Efficiencies

- Insulate

- Heat

- Ventilate
  - Dehumidify

Air Conditioning

Maximising Efficiencies

OPERATION RANGE

If operating outside the following conditions, safety devices may activate, rendering the air conditioner inoperable or may cause the indoor unit to sweat.

The setting temperature range of the remote controller is 16°C~32°C.

	°C			°C
RS50-60 RKS25-35-50-60 RXS25-35-50-60	°C DB °C WB	21~32 14~23	≤80%	−10~46(*)
3MKS50 4MKS58-75-90 3MXS52 4MXS68-80	°C DB °C WB	21~32 14~23	≤80%	−10~46

	°C		°C	
RXS25-35	°C DB	10~30	°C DB °C WB	−10~24 −15~20
RXS50-60	°C DB	10~30	°C DB °C WB	−14~24 −15~18
3MXS52 4MXS68-80	°C DB	10~30	°C DB °C WB	−10~21 −15~15.5

(DB=dry bulb, WB=wet bulb, =cooling, =heating, =indoor, =outdoor, °C=temperature, =humidity)

Invest Northern Ireland
Building Locally Competing Globally

Mabbett™

European Union
European Regional Development Fund

Air Conditioning

Maximising Efficiencies

- Test Conditions

  7°C external providing 20°C internal

- Lower temperature

  lower kW = lower heat output

Too Well Insulated?

Maximising Efficiencies

- Plant Rooms
  - Pressurisation units
  - Condensing boiler drains
    - tundish

Too Well Insulated?

Maximising Efficiencies

- Cold loft spaces
  - Is loft warm or cold space?
  - Pipes in loft?
  - In extreme cold, let warm air into the roofspace
  - Consider frost protection heating

Drainage

Maximising Efficiencies

- Clean before frost comes
  - valleys
  - guttering
  - down pipes
  - flat roofs
  - box gutters
  - etc