

Our ref: 08126/stackheight/RB
21st December 2023

Furness Property Solutions Ltd
Unit 8c Hackworth Industrial Park
Shildon
DL4 1HF

Dear Mike,

Re: Stack Height Calculations – Waste Wood Burners, Shildon

Please find attached the D1 Stack Height Calculations for the following facilities: -

Boiler 1
Boiler 2
Boiler 3
Boiler 4

Each point source of emissions of atmosphere was assessed for the following parameters: -

Parameter	Method of Measurement
Carbon Monoxide	BS EN 15058
Oxides of Nitrogen	BS EN 14792
Particulate	BS EN 13284-1
Gas Velocity	BS EN 16911-1

The D1 Stack Height calculations were completed using data for Total Particulate Matter, Carbon Monoxide and Oxides of Nitrogen (as NO₂).

The calculations took into account both the boiler house and the neighbouring shed.

The calculated stack heights are as follows: -

- Boiler 1 1m above roof line of boiler house
- Boiler 2 1.1m above roof line
- Boiler 3 0.9m above roof line
- Boiler 4 0.5m above roof line

We would recommend that all stacks are extended to reach 1m above the roof line to adequately disperse contaminants.

This information must be forwarded to the Local Authority for consultation.

If you have any queries regarding this matter, please do not hesitate to contact me.

Yours sincerely,



Rachel Bowman

Appendix 1 Data Used

Particulate Matter Data (PM10)

A guideline concentration of 40ug/m³ was taken from the national Air Quality Objectives data.

Background concentrations of PM10 of 13ug/m³ came from Defra / GIS Mapping.

Carbon Monoxide Data

A guideline concentration of 10.0 mg/m³ was taken from the national Air Quality Objectives data.

Background concentrations of Carbon Monoxide of 0.40 mg/m³ came from Defra / GIS Mapping.

Oxides of Nitrogen (as NO₂) Data (PM10)

A guideline concentration of 0.04 mg/m³ was taken from the national Air Quality Objectives data.

Background concentrations of 0.011mg/m³ came from Defra / GIS Mapping.

Appendix 2A Discharge Stack Height Calculation Boiler 1

Parameter	Value
Exhaust Gas Volume Flow Rate, @T (m3/s)	0.4875
Stack Inside Diameter, D (m)	0.25
Gas Discharge Velocity, V (m/s)	9.93
Discharge Gas Temperature, T (K)	454.2

Pollutant Data

Compound	Emission Rate	Guideline Concs	Backgrd Concs	Pollution Index
	(g/s)	(mg/m3)	(mg/m3)	(m3/s)
Particulate	0.00080	0.04000	0.01300	29.62963
Carbon Monoxide	0.05798	10.00000	0.40000	6.03906
Nitrogen Dioxide	0.04040	0.04000	0.01100	1393.20690

Building Information - All Buildings Within Distance of 5Um.

Building	Height (m)	'Width' (m)	'K' (m)	'T' (m)
Boiler Shed	3.5	10.0	3.5	8.8
Storage Shed	6.0	15.0	6.0	15.0
	Hm: 6			Tm: 15.0

Calculation

Pollution Index (m ³ /s)	1,393
Heat Released at Discharge Stack (MW)	0.06
Coefficient `a`	-0.882
Coefficient `b`	0.484
Uncorrected Discharge Stack Height for Bouyancy, Ub (m)	4.36
Minimum Value of Ub (m)	1.15
Selected Value of Ub (m)	4.36
Discharge Momentum, M	3.02
Coefficient `x`	-3.98
Coefficient `y`	5.60
Coefficient `z`	-0.08
log ₁₀ Um	0.21
Uncorrected Discharge Stack Height for Momyentum, Um (m)	1.61
Minimum Value of Um (m)	1.17
Selected Value of Um (m)	1.61
Uncorrected Chimney Height, U (m)	1.61
Coefficient `A`	0.369
Final Discharge Height (m) from ground level	4.5

Appendix 2B Discharge Stack Height Calculation Boiler 2

Parameter	Value
Exhaust Gas Volume Flow Rate, @T (m ³ /s)	0.50361
Stack Inside Diameter, D (m)	0.25
Gas Discharge Velocity, V (m/s)	10.26
Discharge Gas Temperature, T (K)	462.3

Pollutant Data

Compound	Emission Rate	Guideline Concs	Backgrd Concs	Pollution Index
	(g/s)	(mg/m ³)	(mg/m ³)	(m ³ /s)
Particulate	0.00101	0.04000	0.01300	37.40741
Carbon Monoxide	0.05843	10.00000	0.40000	6.08646
Nitrogen Dioxide	0.03040	0.04000	0.01100	1048.17241

Building Information - All Buildings Within Distance of 5Um.

Building	Height (m)	`Width' (m)	`K' (m)	`T' (m)
Boiler Shed	3.5	10.0	3.5	8.8
Storage Shed	6.0	15.0	6.0	15.0
	Hm: 6			Tm: 15.0

Calculation

Pollution Index (m ³ /s)	1,048
Heat Released at Discharge Stack (MW)	0.07
Coefficient `a`	-0.887
Coefficient `b`	0.484
Uncorrected Discharge Stack Height for Bouyancy, Ub (m)	3.76
Minimum Value of Ub (m)	1.17
Selected Value of Ub (m)	3.76
Discharge Momentum, M	3.16
Coefficient `x`	-3.98
Coefficient `y`	5.59
Coefficient `z`	-0.25
log ₁₀ Um	0.10
Uncorrected Discharge Stack Height for Momentum, Um (m)	1.25
Minimum Value of Um (m)	1.19
Selected Value of Um (m)	1.25
Uncorrected Chimney Height, U (m)	1.25
Coefficient `A`	0.333
Final Discharge Height (m) from ground level	4.6

Appendix 2C Discharge Stack Height Calculation Boiler 3

Parameter	Value
Exhaust Gas Volume Flow Rate, @T (m ³ /s)	0.49417
Stack Inside Diameter, D (m)	0.25
Gas Discharge Velocity, V (m/s)	10.07
Discharge Gas Temperature, T (K)	479

Pollutant Data

Compound	Emission Rate	Guideline Concs	Backgrd Concs	Pollution Index
	(g/s)	(mg/m ³)	(mg/m ³)	(m ³ /s)
Particulate	0.05936	0.04000	0.01300	2198.55967
Carbon Monoxide	0.21201	10.00000	0.40000	22.08478
Nitrogen Dioxide	0.07297	0.04000	0.01100	2516.09196

Building Information - All Buildings Within Distance of 5Um.

Building	Height (m)	'Width' (m)	'K' (m)	'T' (m)
Boiler Shed	3.5	10.0	3.5	8.8
Storage Shed	6.0	15.0	6.0	15.0
	Hm: 6			Tm: 15.0

Calculation

Pollution Index (m ³ /s)	2,516
Heat Released at Discharge Stack (MW)	0.07
Coefficient `a`	-0.890
Coefficient `b`	0.484
Uncorrected Discharge Stack Height for Bouyancy, Ub (m)	5.71
Minimum Value of Ub (m)	1.18
Selected Value of Ub (m)	5.71
Discharge Momentum, M	2.94
Coefficient `x`	-3.98
Coefficient `y`	5.61
Coefficient `z`	0.01
log ₁₀ Um	0.39
Uncorrected Discharge Stack Height for Momentum, Um (m)	2.45
Minimum Value of Um (m)	1.16
Selected Value of Um (m)	2.45
Uncorrected Chimney Height, U (m)	2.45
Coefficient `A`	0.429
Final Discharge Height (m) from ground level	4.4

Appendix 2D Discharge Stack Height Calculation Boiler 4

Parameter	Value
Exhaust Gas Volume Flow Rate, @T (m ³ /s)	0.5033
Stack Inside Diameter, D (m)	0.25
Gas Discharge Velocity, V (m/s)	10.25
Discharge Gas Temperature, T (K)	441.3

Pollutant Data

Compound	Emission Rate	Guideline Concs	Backgrd Concs	Pollution Index
	(g/s)	(mg/m ³)	(mg/m ³)	(m ³ /s)
Particulate	0.00096	0.04000	0.01300	35.49259
Carbon Monoxide	0.07351	10.00000	0.40000	7.65682
Nitrogen Dioxide	0.07297	0.04000	0.01100	2516.09196

Building Information - All Buildings Within Distance of 5Um.

Building	Height (m)	'Width' (m)	'K' (m)	'T' (m)
Boiler Shed	3.5	10.0	3.5	8.8
Storage Shed	6.0	15.0	6.0	15.0
	Hm: 6			Tm: 15.0

Calculation

Pollution Index (m ³ /s)	2,516
Heat Released at Discharge Stack (MW)	0.06
Coefficient `a'	-0.881
Coefficient `b'	0.484
Uncorrected Discharge Stack Height for Bouyancy, Ub (m)	5.82
Minimum Value of Ub (m)	1.15
Selected Value of Ub (m)	5.82
Discharge Momentum, M	3.31
Coefficient `x'	-3.98
Coefficient `y'	5.58
Coefficient `z'	-0.41
log ₁₀ Um	0.33
Uncorrected Discharge Stack Height for Momentum, Um (m)	2.12
Minimum Value of Um (m)	1.20
Selected Value of Um (m)	2.12
Uncorrected Chimney Height, U (m)	2.12
Coefficient `A'	0.364
Final Discharge Height (m) from ground level	4.0