Site: Meikle whiterashes, Turiff, Aberdeenshire, AB53 5RA

Required Parameters of Stack

Diameter of Vent at discharge point			0.25	m
Area of stack at discharge point			0.049087	m²
	w	b	h	
Building Dimensions	**Outside**			
Discharge gas temperature Td	250	523		- As per Guidline
Discharge volume of gases V		0.382882		m³/s
Gas discharge velocity w		7.8		m/s
Stack Oxygen (dry) (O2d)		10		%
Moisture in discharge (H2Od)		17		%

Measured emissions concentration limits are

Emmission certificate is prodeced using average of 3 Pm values and using average NOx value from the reader.

PM10, mg/m³ 47.6 56.5 55.3

NO2, mg/m³ Average 65.5 Maximum 115.3 Maximum at STP 97

PM	mg/m³	56.5	
NO2	mg/m³	97	
CO	mg/m³	n/a	

At conditions of STP i.e. 273K, 101.3kPa, 11% O2 dry

Stack Height Calculation

Pollutant Discharge Rates D	mg/m3	g/s	
PM	56.5	0.021633	
Nox	115.3	0.044146	
CO	1000	0.382882	Assumed

Guideline Concentrations are as follows Gd	mg/m3	
PM	0.05	
Nox	0.2	
CO	10	

Background Concentrations are as follows Bc		mg/m3	
PM		0.01074	
Nox	(0.00248)	0.00998	- As per Guidline
CO		0.124	

To find the background concentrations I used nearest coordinate: N 846500 E 364500

Calculation of the pollution index

1	Pi(dust)	551.016
2	Pi(NO2)	232.3242
3	Pi(CO)	38.76889

The largest Pollution index is then used to calculate discharge stack height.

Pi(dust)	551.016

Calculation of Ub (uncorrected Discharge Stack Height for buoyancy)

Substituting the relevant values into the equation elbow, the **heat release (Q)** is calculated

Q= 0.060587 MW

*The ambitient temperature is assumed to be 10°C (283K)

The uncorrected discharge stack height due to buoyancy Ub is determined by the fallowing equation

Ub = 10^a*Pi^b

	Q<=1 MW	Q>1MW
a	-0.878651451	-0.99209
b	0.48391188	0.476537

Ub 2.804339 m

Min Ub 1.144685 m

Ubmin =1.95*Q^0.19
Ubmin =1.7+.25*Q^0.9

Calculation of Um (Uncorrected Discharge Stack Height for momentum)

The discharge momentum, M, is determined using the equation below:

M= 283/Td*V*w = 1.6160093 m4/s2

log10 Um =x+(y*LOG10*Pi+z)^0.5

x=-3.7+(log10M)^0.9	-3.45616829
y=5.9-0.624*log10M	5.769931037
z=4.24-9.7*log10M+1.47(log10M)^2-0.07(log10M)^3	2.281330476

log10Um	0.797966058
Um	**6.280092754**
Min Um	0.956127665

Reference Distance
(5*Um) 31.40046377

Buildings	H*	W	K	T	R
Rock Cliff	7.6	10.0	7.6	19	4.7
Agri Workshop	8.4	27.0	8.4	21	30.2

* Height from the boiler ground level.

Hm	8.4
Tm	21
U	2.804339
A	2.23942
C	**12.66** m

Total Flue height 10 m + 2.7 m boiler height.

Total calculated Stack Height **12.7 m**