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BACKGROUND INFORMATION DOCUMENT (BID)

Atmospheric Emissions Licence Variation Process

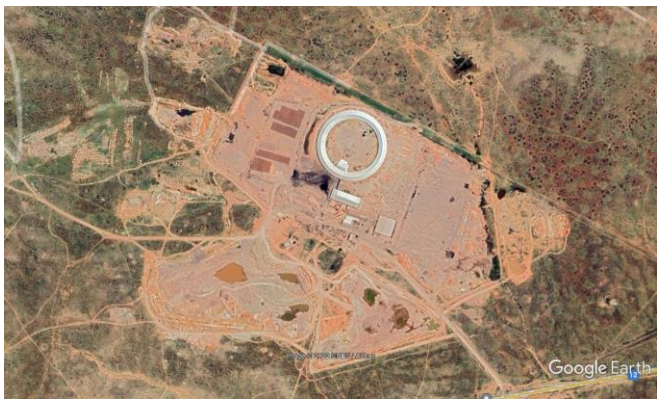
Johnsons Bricks

September 2022

Introduction & Background

Morning Glow Trading (Pty) Ltd trading as Johnsons bricks have submitted an application for the variation of their existing atmospheric emissions licence to the licensing authority, Garden District Municipality.

This application was submitted in terms of chapter 5 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) for the existing brick manufacture facility on the site.



Why is this application process necessary?

Johnsons Bricks wishes to increase the production throughput of their existing brick manufacture facility. Such an application requires a variation of the existing waste management licence.

Cape Environmental Assessment Practitioners *(Cape EAPrac)* have been appointed, as independent environmental assessment practitioners (EAP), to facilitate the legally required public participation process.

What is the purpose of this document?

The main purpose of this **Background Information Document** (BID) is to:

- Provide potential "Interested and Affected Parties" (I&APs) with information regarding the existing facility;
- Provide potential I&AP's with information regarding the proposed variations to the atmospheric emissions licence;
- Describe the process being undertaken;
- Provide I&APs with the opportunity to raise issues or concerns regarding the variation of this licence;
- Provide information on the way-forward for the remainder of the process.

Description of the site & surrounding environment

The site falls within the **Oudtshoorn** municipal area of the Western Cape Province of South Africa.

The site is situated directly east of Oudtshoorn along the N12 to De Rust.

The surrounding land use consists of Agriculture (both intensive and extensive agricultural practices adjacent to study site);

The closest residential area is approximately 850m southwest of the site and south of the N12.

A location map showing the facility as well as the surrounding land-use is attached.

What is being proposed?

The applicant is applying to increase the production throughput of the existing brick manufacture facility. The increase in the production throughput will not require the expansion or any physical changes to the existing facility. The applicant proposes the increase of the production throughput from 18 Million Bricks per annum to 66 Million bricks per annum. This production throughput increase will occur utilising the existing rotating kiln on the property. The maximum allowable emission limits will remain unchanged.

Brick Manufacturing Process

The process entails the manufacture of clay bricks using a rotary kiln.

This brick manufacturing process entails:

- Mining of aggregate (clay)
- Crushing & screening of aggregate
- Blending and mixing of aggregate
- Shaping of “green” bricks (extrusion)

The green bricks are then packed mechanically in a circular basis which is under cover.

A kiln that provides the energy for vitrification moves over the circular packed bricks thus drying, firing and cooling bricks in a single operation.

Fired, or "red" bricks are removed mechanically from the kiln area after completion of the process.

The whole process is carried out under roof, thus preventing negative impacts on the process due to inclement weather.

Flue gases generated in the process are extracted continuously by fans and vented to atmosphere via a dedicated wet scrubber to remove particulate matter and gaseous pollutants. Effluent from the scrubber is collected in a multi-stage pit where it is clarified and recycled to the blending and mixing stage of the process.

Please also see the attached Emissions survey report. As can be seen in this report, during the previous reporting cycle, the measured emissions were all below the allowable concentrations. The allowable emissions concentrations will not be increased and the industry will still be required to ensure they remain within the allowable limits.

What legislation applies?

This application process is undertaken in terms of the National Environmental Management Air Quality Act (Act 39 of 2004) Ito the above Act, the following listed activities are applicable:

Category 5, Sub Category 5.3: Mineral processing, storage and handling.

This activity is relevant to all facilities where bricks are fired using methods other than clamp kilns.

Why and how should I get involved?

In the event that you have an **interest** in the project, or feel that you **may be affected** by the issuing of this licence, you are invited to provide comment / objection to the issuing of this licence.

All comments must be submitted in Cape EAPrac in writing by fax, email or post by no later than **24 October 2022**.

What does the remainder of the process entail?

Cape EAPrac will formally respond to all comments received during the comment period. Where necessary, specialist input will be sought to inform responses.

On completion of the public participation process, Cape EAPrac will submit a comment and response report for submission to Garden Route District Municipality.

Based on all available information, Garden Route District Municipality will take a decision on whether or not to vary the licence.

If Garden Route District Municipality do decide to grant the licence, this decision will be communicated to all parties that provided comment or objection during this public participation process.

The varied licence if issued will contain conditions for annual emissions monitoring of both dust fall out as well as well as sulphur dioxide (SO_2) to ensure that the minimum emissions standards are complied with. Any necessary improvements required to address air quality issues will also form part of the licence conditions.

ONLY THOSE PARTIES THAT FORMALLY *REGISTER WITH CAPE EAPrac or SUBMIT COMMENT / OBJECTION* WILL BE KEPT INFORMED (RECEIVE PROJECT RELATED INFORMATION) THROUGHOUT THE REMAINDER OF THE PROCESS.

Please make sure to send any comments / objections, in writing, to:

Cape EAPrac
ATT: Dale Holder
PO Box 2070, George, 6530
Telephone: 044 874 0365
Facsimile: 044 874 0432
E-mail:dale@cape-eaprac.co.za
Website: www.cape-eaprac.co.za

Comments / Objections must reach this office no later than:
24 October 2022


R328
Cango Wildlife Ranch
Kleinplaas Resort
OUDTSHOORN
Johnsons Bricks
12
Oudtshoorn Hospital-ER
Micheal Cover Shop
Stolsvlakte NGK Pr
R62
Oudtshoorn
Oudtshoorn Traffic Department
R328
Oudtshoorn
Oudtshoorn
Die Smitswinkel
Rooiheuwel VGK
Greeff Cottag
Image © 2022 Maxar Technologies
Image © 2022 CNES / Airbus
Shadowlands Guest Farm
Google Earth

EMISSION SURVEY REPORT

6 May 2022

prepared for

Johnson's Bricks

Oudtshoorn, Eastern Cape

Report No. JON-317

BY

Lethabo Air Quality Specialists (Pty) Ltd
2018/109208/07

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EXECUTIVE SUMMARY

Lethabo Air Quality Specialists (Pty) Ltd (LAQS) conducted an emission survey on the stack serving Johnson's Bricks' (JB) moving brick kiln near Oudtshoorn in the Eastern Cape on 15 March 2022 and 6 April 2022. The tests conducted on 15 March 2022 were on one of the two ducts leading to the stack. Two fans feed flue gas to the stack through two separate ducts and the tests done on 6 April 2022 were aimed at determining if there was a difference in concentration between the two ducts. As the tests were conducted for comparative purposes, only two sets of sets were carried out instead of the mandatory three tests.

The objective of the measurement program was to quantify the emission of pollutants and record operating parameters in the stack in accordance with the *"List of Activities which Result in Atmospheric Emissions"* as published in Government Notice 893 on 22 November 2013 (GN893). Table A provides a summary of the pollutants measured for the stack and indicates compliance with regards to the relevant emission standards as listed in Subcategory 5.9: *"Ceramic Production"* of GN893.

Pollutant	**New plant emission limit**	
	15 March 2022	6 April 2022
Particulate matter (PM)	✓	✓
Sulphur dioxide (SO_2)	✓	✓
Total fluorides as HF	✓	✓

Table A: Emission Survey Summary

In addition, the quantification of the pollutants mentioned above, the following parameters were measured as part of the emission survey, where applicable:

- Gas velocity and gas volumetric flow rate
- Total suspended particulate matter concentration
- Combustion gasses concentration
- Gas temperature and pressure

This report details the methodology applied by LAQS as well as the results obtained from the emission survey

Contents

1 INTRODUCTION

Johnsons Bricks (JB) operates a moving kiln clay brick manufacturing plant at their premises in Oudtshoorn in the Eastern Cape. Two fans extract flue gases from the circular ducting and feed the gases to a single stack and wet scrubber via two individual rectangular ducts.

LAQS conducted emission measurements on one of the ducts, i.e. on the inlet to the scrubber, on 15 March 2022. In order to determine if there are differences in concentrations between the two ducts, LAQS carried out emission measurements on both ducts simultaneously on 6 April 2022. As the tests were conducted for comparative purposes, only two sets of sets were carried out instead of the mandatory three tests.

The process used by JB is included in the *"List of Activities which Result in Atmospheric Emissions"* as published in Government Notice 893 on 22 November 2013 (GN893). Subcategory 5.9: "*Ceramic Production"* is applicable. The emission limits applicable to Subcategory 5.9 are summarised below:

Common name	Symbol/ abbreviation	Effective date	mg/Nm^3 under normal conditions of 273 Kelvin and 101.3 kPa
Particulate matter	PM	1 April 2020	50
		Pre-April 2020	150
Sulphur dioxide	SO_2	1 April 2020	400
		Pre-April 2020	1000
Total fluorides as hydrogen fluoride	F as HF	1 April 2020	50

2 METHODOLOGY

For legislative compliance purposes a minimum of three (3) tests, with a minimum duration of sixty (60) minutes per test are required.

A Dado ST5 and a Tecora Isostack G4 automated isokinetic sampling systems were used to carry out all the isokinetic measurements described below.

A Testo 350 portable emissions analyser was used to measure the concentrations of O_2, CO, NO, NO_2, SO_2 and CO_2 present on a volume/volume basis. The analyser is certified to comply with the requirements of EN 50379-2:2004, "Specification for Portable Electrical Apparatus Designed to Measure Combustion Gas Parameters" and the Environment Agency's (UK) "Performance Standard for Handheld Emissions Monitoring Systems (HEMS), Version 4 dated September 2018".

The following methods apply to the work done by LAQS:

Parameter	Method type	Method reference
Stack gas velocity		USEPA Method 1: "*Sample and Velocity Traverses for Stationary Sources*" USEPA Method 2: "*Determination of Stack Gas Velocity and Volumetric Flow Rate (Type-S Pitot Tube)*". Gas velocities are calculated from data obtained from point velocity differential pressure measurements. Velocity differential pressure measurements are taken by means of an S-type pitot tube. Volumetric flow rates are calculated from the individual point velocities and internal dimensions of the stack.
Stack gas temperature		The gas temperatures are measured by means of a Type-K thermocouple connected to a digital thermometer.
Particulate matter (PM)	Isokinetic	USEPA Method 17: "*Determination of Particulate Matter Emissions from Stationary Sources*" This entails in-stack filtration, with the filter at stack conditions of temperature and pressure. High-purity quartz glass microfiber thimbles are used. The thimbles are completely free of binders or additives and can be used at temperatures up to 850°C or when using solvents incompatible with cellulose thimbles. These thimbles have a 0.8 µm nominal particle retention capability.

Parameter	Method type	Method reference
Stack moisture content	Isokinetic	USEPA Method 4: "*Determination of Moisture Content in Stack Gases*" Moisture contained in the gas sample extracted isokinetically from the source is condensed through a series of impingers in an ice bath followed by a silica gel scrubber. The moisture content is calculated from the volume condensed and the mass of moisture entrained on the silica gel.
Total fluoride as hydrogen fluoride (F as HF)	Anisokinetic	USEPA Method 13: "*Determination of Total Fluoride Emissions from Stationary Sources"* USEPA Method 26: "*Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Non-Isokinetic Method*" A known volume of stack gas is extracted at a constant rate from each stack. The samples are passed through a sulphuric acid solution for the collection of fluorides. The samples are analysed by means of ion chromatography. The particles captured through isokinetic sampling on the thimbles are analysed for fluorides

3 RESULTS

All raw data collected during the test period are available at LAQS's offices and will be made available to interested parties on written authorisation by Johnson's Bricks.

All of the international isokinetic methods referred to in Section 2 above state that isokinetic results will be acceptable if the isokinetic sampling deviation is less than 10%.

Results obtained are reported at the following conditions:

Normal temperature and pressure (NTP): This condition is also referred to as NTP and refer to conditions at 0°C (273.15 K) and 101.325 kPa.

Where concentrations are reported at NTP or mg/Nm^3 it refers to the conversion of concentrations to NTP conditions. As these conditions imply a reduction in the sampled gas volume due to the effect of reduced temperature and increased pressure, the resulting calculated concentration is higher than at actual stack gas conditions.

NTP, dry: Current emission limits require results to be reported at NTP on a dry basis, i.e. based on the gas volume with water vapour removed. The removal of the water vapour content from the stack gas implies a further reduction in gas volume, resulting in even higher calculated concentrations.

The following results were obtained:

3.1 Right-hand duct, 15 March 2022; Hollow bricks

Description	Unit	Test 1	Test 2	Test 3	Average
Date	-	15 March 2022			
Time of day	-	09:42	11:15	12:35	
Test duration	min	60	60	60	
Barometric pressure	kPa	97.85	97.85	97.85	97.85
Duct Static pressure	kPa	0.05	0.06	0.07	0.06
Gas temperature (average)	°C	68.7	71.6	72.6	71.0
Gas velocity	m/s	13.1	12.8	13.1	13.0
Stack diameter	m	2 x 1.2			
Volumetric flow rate (actual)	m^3/h	113 000	111 000	113 000	112 000
Volumetric flow rate (NTP, wet)	Nm^3/h	87 400	84 700	86 500	86 200
Volumetric flow rate (NTP, dry)	Nm^3/h	86 100	79 500	82 300	82 600
Water concentration	% (v/v)	1.4	6.1	4.9	4.1
Total particulate concentration					
Isokinetic efficiency	%	96.8	101.6	100.4	
PM concentration (actual)	mg/m^3	10.7	5.8	4.9	7.1
PM concentration (NTP, wet)	mg/Nm^3	13.8	7.6	6.5	9.3
PM concentration (NTP, dry)	mg/Nm^3	14.0	8.1	6.8	9.6
Emission limit	**mg/Nm^3**	**New: 50 Existing: 150**			
Total particulate emission rate	kg/h	1.21	0.64	0.56	0.80

Table 1a: Right-hand duct; Stack conditions and particulate emissions

Substance	Unit	Test 1	Test 2	Test 3	Average	Current limit	Previous limit
O_2	**%**	19.6	19.5	19.5	19.5		
CO	mg/Nm^3, dry	1 410	1 480	1 500	1 460		
NO		14.5	14.9	14.6	14.7		
NO_2		8.1	7.9	9.0	8.3		
NOx as NO_2		30.3	30.8	31.4	30.8		
SO_2(*)		48.4	39.2	26.1	37.9	**400**	**1 000**
CO_2	g/Nm^3, dry	21.6	23.2	23.7	22.8		
SO_2	kg/h	4.17	3.12	2.15	3.14		

(*): Refer to Section 4.4

Table 1b: Right-hand duct; Summary of gas concentrations and emission rates per test

Description	Unit	Test 1	Test 2	Test 3	Average
HF, gas phase	mg/Nm^3, dry	0.29	0.78	4.42	
Fluorides in particulates as HF		7.98	4.80	5.13	
Total F as HF		8.27	5.58	9.55	7.80
Emission limit		**50**			
F as HF emission rate	kg/h	0.71	0.44	0.79	0.64

Table 1c: Right-hand duct; Fluorides as hydrogen fluoride concentrations and emission rates

3.2 Right-hand duct, 6 April 2022; Solid bricks

Description	Unit	Test 1	Test 2	Average
Date	-	6 April 2022		
Time of day	-	11:43	13:42	
Test duration	min	60	60	
Barometric pressure	kPa	97.01	97.01	97.01
Duct Static pressure	kPa	0.09	0.06	0.07
Gas temperature (average)	°C	89.7	88.1	88.9
Gas velocity	m/s	11.6	11.6	11.6
Stack diameter	m	2 x 1.2		
Volumetric flow rate (actual)	m^3/h	100 000	100 000	100 000
Volumetric flow rate (NTP, wet)	Nm^3/h	72 200	72 600	72 400
Volumetric flow rate (NTP, dry)	Nm^3/h	70 300	68 400	69 400
Water concentration	% (v/v)	2.7	5.8	4.3
Total particulate concentration				
Isokinetic efficiency	%	100.5	103.2	
PM concentration (actual)	mg/m^3	11.1	9.01	10.1
PM concentration (NTP, wet)	mg/Nm^3	15.4	12.4	13.9
PM concentration (NTP, dry)	mg/Nm^3	15.9	13.2	14.6
Emission limit	**mg/Nm^3**	**New: 50 Existing: 150**		
Total particulate emission rate	kg/h	1.12	0.90	1.01

Table 2a: Right-hand duct; Stack conditions and particulate emissions

Substance	Unit	Test 1	Test 2	Average	Current limit	Previous limit
O_2	%	19.7	19.7	19.7		
CO	mg/Nm^3, dry	1 120	1 110	1 110		
NO		16.6	18.3	17.5		
NO_2		10.7	7.8	9.3		
NOx as NO_2		36.1	35.8	36.0		
SO_2		BDL	BDL	BDL	**400**	**1 000**
CO_2	g/Nm^3, dry	20.9	21.3	21.1		
SO_2	kg/h	BDL	BDL	BDL		

(*): Refer to Section 4.3

Table 2b: Right-hand duct; Summary of gas concentrations and emission rates per test

Description	Unit	Test 1	Test 2	Average
HF, gas phase	mg/Nm^3, dry	BDL	BDL	
Fluorides in particulates as HF		1.39	1.62	
Total F as HF		1.39	1.62	1.50
Emission limit		**50**		
F as HF Emission Rate	kg/h	0.10	0.11	0.11

Table 2c: Right-hand duct; Fluorides as hydrogen fluoride concentrations and emission rates

3.3 Left-hand duct, 6 April 2022; Solid bricks

Description	Unit	Test 1	Test 2	Average
Date	-	6 April 2022		
Time of day	-	11:36	13:35	
Test duration	min	60	60	
Barometric pressure	kPa	97.50	97.50	97.50
Duct Static pressure	kPa	0.09	0.08	0.085
Gas temperature (average)	°C	48.3	48.8	48.6
Gas velocity	m/s	11.6	11.3	11.5
Stack diameter	m	2 x 1.2		
Volumetric flow rate (actual)	m^3/h	99 800	97 900	98 800
Volumetric flow rate (NTP, wet)	Nm^3/h	81 700	80 000	80 900
Volumetric flow rate (NTP, dry)	Nm^3/h	79 500	77 400	78 500
Water concentration	% (v/v)	2.6	3.3	3.0
Total particulate concentration				
Isokinetic efficiency	%	98.8	99.5	
PM concentration (actual)	mg/m^3	9.6	7.4	8.5
PM concentration (NTP, wet)	mg/Nm^3	11.6	9.1	10.3
PM concentration (NTP, dry)	mg/Nm^3	11.9	9.4	10.6
Emission limit	**mg/Nm^3**	**New: 50 Existing: 150**		
Total particulate emission rate	kg/h	0.95	0.73	0.84

Table 3a: Left-hand duct; Stack conditions and particulate emissions

Substance	Unit	Test 1	Test 2	Average	Current limit	Previous limit
O_2	**%**	19.9	19.9	19.9		
CO	mg/Nm^3, dry	893	903	898		
NO		13.8	17.3	15.6		
NO_2		2.8	1.8	2.3		
NOx as NO_2		23.9	28.3	26.1		
SO_2(*)		BDL	BDL	BDL	**400**	**1 000**
CO_2	g/Nm^3, dry	15.6	16.5	16.0		
SO_2	kg/h	BDL	BDL	BDL		

(*): Refer to Section 4.4

Table 3b: Left-hand duct; Summary of gas concentrations and emission rates per test

Description	Unit	Test 1	Test 2	Average
HF, gas phase	mg/Nm^3, dry	BDL	BDL	
Fluorides in particulates as HF		0.04	1.44	
Total F as HF		0.04	1.44	0.74
Emission limit		**50**		
F as HF Emission Rate	kg/h	0.003	0.11	0.06

Table 3c: Left-hand duct; Fluorides as hydrogen fluoride concentrations and emission rates

4 DISCUSSION

4.1 Sample Port Location

Three equally spaced sample ports were used on each duct. The sample ports are located less than eight diameters downstream from the induced draft fans implying that the flow profile may not yet be fully developed at the sampling location. However, considering the layout of the facility, the sample ports are located at the most suitable location for isokinetic sampling.

4.2 Isokinetic Sampling Efficiency

The parameter which must be controlled to establish isokinetic sampling is the gas velocity as it enters the nozzle of the sample probe. This velocity must be equal to the actual gas velocity at the specific sample point in the duct/stack. Isokinetic deviations can cause oversampling or under-sampling of certain particle sizes.

An average isokinetic efficiency of 90 % to 110 % is considered acceptable in accordance with the prescribed isokinetic sampling methods. The isokinetic sampling efficiencies were calculated to be within the specified limit of the prescribed method for all isokinetic measurements conducted on the stack as can be seen from Tables 1a, 2a and 3a.

4.3 Representativeness of Sampling Results

On both test dates, the kiln was running at a rate that would yield 5.2 million bricks per month. Hollow bricks were produced on 15 March 2022 while solid bricks were produced on 6 April 2022.

It is LAQS's opinion that the emissions reported are representative of the operating conditions that prevailed in the scrubber inlet ducts at the times that the samples were taken. The results may vary should plant operating conditions change due to, e.g. fuel feed rate, raw material feed rate, composition changes, etc.

4.4 Compliance with Emission Standards

Particulate matter (PM)

The average concentration of particulate matter (PM) in the right-hand inlet duct during the tests conducted on 15 March 2022 was 9.6 mg/Nm^3, dry gas conditions.

The average concentrations in the right-hand and left-hand inlet ducts during the tests conducted on 6 April 2022 were 14.6 and 10.6 mg/Nm^3, dry gas conditions, respectively.

All of the measured particulate matter concentrations were below the emission limit of 50 mg/Nm^3, dry conditions.

Sulphur dioxide (SO_2)

The reported SO_2 results must be interpreted with care. The flue gas conditions leading into the scrubber are quite unique in the sense that both the O_2 and CO concentrations are quite high.

SO_2 measurements were conducted by means of a Testo flue gas analyser which uses electrochemical sensors to analyse, inter alia, the SO_2 concentration. As the concentration of sulphur dioxide is significantly less than the concentration of carbon monoxide, the potential cross-interference should be considered.

Carbon monoxide interferes negatively with the sulphur dioxide measurement, resulting in reduced reported SO_2 concentrations. At the span concentration of 2000 parts per million (ppm) or 5720 mg/Nm^3, the potential interference from carbon monoxide is 13 ppm or 37.2 mg/Nm^3.

In addition, high VOC levels also affect the performance of the SO_2 cell. At the time of the measurements, spot checks were done on CO and SO_2 concentrations at various locations on the kiln. It was found that CO levels were low and SO_2 levels were high in the firing zone of the kiln, but the inverse was measured in the first section of the brick drying zone. LAQS ascribed this to devolatilization of the wet bricks with partial combustion of internal fuels in the clay to produce high CO values. LAQS was not geared up to do VOC measurements at the same time, but it is likely that VOCs would also be liberated at the same stage, thus further influencing the performance of the SO_2 electrochemical cell.

The reported values are the results of actual measurements during the two test days. Bearing in mind the probable cross-interference of CO, LAQS is of the opinion that the maximum average SO_2 could be approximately 75.0 mg/Nm^3 for the tests conducted on 15 March 2022 and approximately 37 mg/Nm^3 for the tests conducted on 6 April 2022.

While it is not possible to state the exact concentration of SO_2 in the flue gas, LAQS is of the opinion that the true concentration will be well below the emission limit of 400 mg/Nm^3, dry gas conditions.

Fluorides as hydrogen fluoride (F as HF)

The average concentration of fluorides, as HF, in the right-hand inlet duct during the tests conducted on 15 March 2022 was 7.80 mg/Nm^3, dry gas conditions.

The average concentrations in the right-hand and left-hand inlet ducts during the tests conducted on 6 April 2022 were 0.74 mg/Nm^3 and 1.53 mg/Nm^3, dry gas conditions, respectively.

All of the measured total fluorides concentrations were below the emission limit of 50 mg/Nm^3, dry conditions.

5 QUALITY CONTROL AND QUALITY ASSURANCE

The sampling emission measuring equipment described in Section 2 are calibrated and were within the validity period of the calibration during the emission survey.

Refer to Appendix B for copies of the calibration certificates.

All sample analyses were conducted by accredited laboratories. Refer to Appendix B for the relevant certifications.

6 CONCLUSIONS

There is a difference between the results reported for the left-hand and right-hand ducts leading to the wet scrubber. The differences are likely to be due to the position of the moving kiln at the time of the tests, resulting in different path lengths from the kiln to each extraction fan. As a result, LAQS is of the opinion that the higher concentrations measured were due to shorter flue gas path length between the position of the kiln and the stack.

It appears that there is also a slight difference in results between the two test days (right-hand ducts) during which two different types of bricks were produced. However, there is insufficient data to confirm whether this difference is due to the type of bricks produced at the time of measurement.

It must be borne in mind that all of the emission measurements were conducted on the inlet ducts to the scrubber. Unfortunately, the scrubber was not fitted with a stack of suitable height to allow emissions measurements on the outlet gasses. As the pollutant concentrations in the scrubber inlet gases are all below the emission limits, it can be expected that outlet concentrations will be lower still.

7 RECOMMENDATIONS

As there is little difference between the pollutant concentrations recorded on the two ducts, LAQS is of the opinion that measurements on one duct only should suffice for future measurements. Should the recommendation be acceptable to the licensing authorities, LAQS recommends that the duct closest to the kiln be used as the concentrations in that duct are likely to be the higher of the two due to the shorter flue gas path length to the extraction fan.

APPENDIX A | DECLARATION

DECLARATION

I, Lawton Truter, hereby declare that the emission measurements conducted by Lethabo Air Quality Specialists (Pty) Ltd were carried out under the operating conditions given below. I also declare that the process/es were operating normally during the time of the measurements.

Date	Process	Percentage of maximum capacity (Or tons processed during emission survey)
15.03.2022	Rotary Kiln. Clay bricks	5200 000.00 kg 2.7 kg per steen.
		Hollow Bricks

Atmospheric Emissions License No: .....

.....
Signature

15.03.2022
Date

Manager
Designation

Manning Glow
Company

De Rust Road Oudtshoorn
Address

DECLARATION

I, Anton Truter, hereby declare that the emission measurements conducted by Lethabo Air Quality Specialists (Pty) Ltd were carried out under the operating conditions given below. I also declare that the process/es were operating normally during the time of the measurements.

Date	Process	Percentage of maximum capacity (Or tons processed during emission survey)
06-04-2022	Rotary Cuba Brick making	Solid Bricks
		5.2 mil/jaar
		3 kg per steen

Atmospheric Emissions License No: .....

.....
Signature

06.04.2022
.....
Date

Manager
.....
Designation

.....
Company

.....
Address

APPENDIX B | CALIBRATION CERTIFICATES

Testo South Africa (Pty) Ltd

Be sure. testo

Calibration Certificate

CAL-G-S-FG-210428L02
Certificate number

sanas Calibration Laboratory 1576

	ANALYZER	CONTROL UNIT
Manufacturer	Testo	Testo
Type	350	350
Part No.	0632 3510	0632 3511
Serial No.	62204425/0120	03401513/0120

Location: **Unit 1 Glen Eagle Office Park**
Corner Braambos Road & Monument Road
Glen Marais
Kempton Park
1630

Company Name: **Lethabo Air Quality Specialists**
Address: **12 Rina Van der Merwe Street**
Wavecrest, Jeffrey Bay
Eastern Cape, South Africa

Internal Order No: **ID18478**

Date of calibration: **28/04/2021**

Was the instrument adjusted? YES

The accuracy of all measurements is traceable to the National Measuring Standards.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%, the uncertainty of measurement has been estimated in accordance with the principles defined in the GUM, guide to uncertainty of measurement , ISO, Geneva, 1993.

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CALIBRATION LABORATORY TESTO SOUTH AFRICA 29 APR 2021 KEMPTON PARK

Calibrated by: Moloti Talane

Signatory: James Taylor

Version: 2.0

Page 1 of 4

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Certificate number

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Reference Standards

Reference Gas Description	Cylinder Number	Certificate Number
O_2 - Oxygen	M55 5731	PRGM0100555731
O_2 - Oxygen	M55 5720	PRGM0100555720
CO – Carbon Monoxide	D95 8385	PRGM07008385
CO – Carbon Monoxide	D73 3632	PRGM0100733632
SO_2 – Sulfur Dioxide	M9 3874	PRGM020093874
SO_2 – Sulfur Dioxide	D54 3912	PRGM0300543912
NO – Nitrogen Monoxide	D19 4849	PRGM0200194849
NO – Nitrogen Monoxide	D19 4944	PRGM0100194944
NO_2 – Nitrogen Dioxide	M9 3882	PRGM010093882
NO_2 – Nitrogen Dioxide	M9 3921	PRGM02003921
CO_2 – Carbon Dioxide	M51 8254	PRGM0100518254
CO_2 – Carbon Dioxide	D95 8328	PRGM0100958328
CO_2 – Carbon Dioxide	M55 5707	PRGM0100555707

Ambient Conditions

Temperature	23°C	± 5°C
Absolute Pressure	842.4mbar	± 50mbar

Measuring procedure
PJ0050

The gas analyzer was calibrated against specific reference gases

As Found Measurement results

Applied Reference Gas	Reference Gas Concentration	Instrument Displayed Concentration	Error	Manufacturers Tolerance	Uncertainty ±
O_2 – Oxygen	2.97%	2.99%	+0.02%	±0.20%	0.05%
	17.95%	18.08%	+0.13%	±0.20%	0.10%
CO – Carbon Monoxide	100ppm	*92ppm	-8ppm	±5ppm	3ppm
	1008ppm	*935ppm	-73ppm	±50ppm	15ppm
SO_2 – Sulfur Dioxide	100ppm	97ppm	-3ppm	±5ppm	3ppm
	1000ppm	983ppm	-17ppm	±50ppm	15ppm
NO – Nitrogen Monoxide	100ppm	101ppm	+1ppm	±5ppm	3ppm
	997ppm	1009ppm	+12ppm	±50ppm	20ppm

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As Found Measurement results (Continued)

Applied Reference Gas	Reference Gas Concentration	Instrument Displayed Concentration	Error	Manufacturers Tolerance	Uncertainty ±
NO_2 – Nitrogen Dioxide	10.0ppm	7.0ppm	-3.0ppm	±5.0ppm	2.0ppm
	99.9ppm	*80.8ppm	-19.1ppm	±5.0ppm	3.0ppm
CO_2 – Carbon Dioxide	0.00%	0.07%	+0.07%	±0.30%	0.10%
	4.95%	5.08%	+0.13%	±0.35%	0.10%
	14.96%	*15.54%	+0.58%	±0.45%	0.20%
	39.61%	*42.78%	+3.17%	±1.10%	0.60%

After Adjustment Measurement results

Applied Reference Gas	Reference Gas Concentration	Instrument Displayed Concentration	Error	Manufacturers Tolerance	Uncertainty ±
O_2 – Oxygen	2.97%	3.00%	+0.03%	±0.20%	0.05%
	17.95%	18.08%	+0.13%	±0.20%	0.10%
CO – Carbon Monoxide	100ppm	98ppm	-2ppm	±5ppm	3ppm
	1008ppm	997ppm	-11ppm	±50ppm	15ppm
SO_2 – Sulfur Dioxide	100ppm	98ppm	-2ppm	±5ppm	3ppm
	1000ppm	997ppm	-3ppm	±50ppm	15ppm
NO – Nitrogen Monoxide	100ppm	98ppm	-2ppm	±5ppm	3ppm
	997ppm	978ppm	-19ppm	±50ppm	20ppm
NO_2 – Nitrogen Dioxide	10.0ppm	8.7ppm	-1.3ppm	±5.0ppm	2.0ppm
	99.9ppm	100.1ppm	+0.2ppm	±5.0ppm	3.0ppm

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CAL-G-S-FG-210428L02
Certificate number

sanas Calibration Laboratory
1576

After Adjustment Measurement results (Continued)

Applied Reference Gas	Reference Gas Concentration	Instrument Displayed Concentration	Error	Manufacturers Tolerance	Uncertainty ±
CO_2 – Carbon Dioxide	0.00%	0.00%	0.00%	±0.30%	0.10%
	4.95%	4.85%	-0.10%	±0.35%	0.10%
	14.96%	14.86%	-0.09%	±0.45%	0.20%
	39.61%	38.89%	-0.72%	±1.10%	0.60%

The basic unit of quantity of substance of the International System of Units is mole:

$1ppm = 1.10^{-6}$ mol.mol^{-1}

$1\% = 1.10^{-2}$ mol.mol^{-1}

Validity of certificate

The measurement results recorded in this certificate were correct at the time of calibration. Where a decision rule is applied a * indicates this result falls outside of the defined specification. The subsequent accuracy will depend on factors such as care, handling, and frequency of use. It is recommended that recalibration be undertaken at an interval that will ensure that the instrument remains within the desired limits.

Decision rule applied

Manufacturer specification without taking into account the uncertainty

End of certificate

Version: 2.0

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envirocon instrumentation (Pty) Ltd
environmental and occupational hygiene instruments

SERVICE & CALIBRATION CERTIFICATE

THIS IS TO CERTIFY THAT THE FOLLOWING GILIBRATOR, WAS SERVICED AND VERIFIED USING A MASTER GILIBRATOR, SERIAL NO: **2001020-*S*** AS A REFERENCE, WHICH HAS BEEN CALIBRATED TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

CERTIFICATE NUMBER: 2021-0225

CUSTOMER	DATE	CELL	BASE
Lethabo Air Quality Specialists	14.04.2021	1706007-S	1706017-B

CELL NO: 1706007-S		**REFERENCE CELL NO: 2001020-S**		**RELATIVE DIFFERENCE**	**PERCENTAGE DIFFERENCE**
Reading:	**cc/min**	**Reading:**	**cc/min**		
1.	**2214**	1.	**2213**	**1**	**0.05%**
2	**2213**	2	**2213**	**0**	**0.00%**
3.	**2214**	3.	**2212**	**2**	**0.09%**
4.	**2213**	4.	**2213**	**0**	**0.00%**
5.	**2212**	5.	**2213**	**-1**	**0.05%**
6.	**2212**	6.	**2214**	**-2**	**0.09%**
7.	**2212**	7.	**2214**	**-2**	**0.09%**
8.	**2212**	8.	**2214**	**-2**	**0.09%**
9.	**2212**	9.	**2213**	**-1**	**0.05%**
10.	**2211**	10.	**2213**	**-2**	**0.09%**
AVG:	**2212.5**	**AVG:**	**2213.2**		
			MAX DIFFERNCE:	**2**	**0.09%**

ATTACHED PLEASE FIND A COPY OF THE REFERENCE CELL CALIBRATION CERTIFICATE

CALIBRATED BY:

T. Moitsheki

NEXT SERVICE / CALIBRATION DUE

April 2022

T. MOITSHEKI
For and on behalf of ENVIROCON INSTRUMENTATION

envirocon instrumentation (Pty) Ltd
environmental and occupational hygiene instruments

SERVICE & CALIBRATION CERTIFICATE

THIS IS TO CERTIFY THAT THE FOLLOWING GILIBRATOR, WAS SERVICED AND VERIFIED USING A MASTER GILIBRATOR, SERIAL NO: **2001020-S** AS A REFERENCE, WHICH HAS BEEN CALIBRATED TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

CERTIFICATE NUMBER: 2021-0225

CUSTOMER	DATE	CELL	BASE
Lethabo Air Quality Specialists	14.04.2021	2002008-h	1706017-B

CELL NO: 2002008-H		**REFERENCE CELL NO: 2001020-S**		**RELATIVE DIFFERENCE**	**PERCENTAGE DIFFERENCE**
Reading:	**Lt/min**	**Reading:**	**Lt/min**		
1.	**5.7**	1.	**5.7**	**0**	**0.00%**
2	**5.7**	2	**5.7**	**0**	**0.00%**
3.	**5.7**	3.	**5.75**	**-0.05**	**0.87%**
4.	**5.7**	4.	**5.7**	**0**	**0.00%**
5.	**5.7**	5.	**5.754**	**-0.054**	**0.94%**
6.	**5.7**	6.	**5.7**	**0**	**0.00%**
7.	**5.7**	7.	**5.7**	**0**	**0.00%**
8.	**5.7**	8.	**5.7**	**0**	**0.00%**
9.	**5.7**	9.	**5.7**	**0**	**0.00%**
10.	**5.7**	10.	**5.7**	**0**	**0.00%**
AVG:	**5.7**	**AVG:**	**5.7104**		
			MAX DIFFERNCE:	**-0.054**	**0.94%**

ATTACHED PLEASE FIND A COPY OF THE REFERENCE CELL CALIBRATION CERTIFICATE

CALIBRATED BY:

T. Moitsheki

NEXT SERVICE / CALIBRATION DUE

April 2022

T. MOITSHEKI
For and on behalf of ENVIROCON INSTRUMENTATION

CERTIFICATE OF ACCREDITATION

In terms of section 22(2) (b) of the Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act, 2006 (Act 19 of 2006), read with sections 23(1), (2) and (3) of the said Act, I hereby certify that:-

CHEMTECH LABORATORY SERVICES CC

Co. Reg. No.: 1998/037710/23

Facility Accreditation Number: **T0361**

is a South African National Accreditation System accredited facility
provided that all conditions and requirements are complied with

This certificate is valid as per the scope as stated in the accompanying schedule of accreditation, Annexure "A", bearing the above accreditation number for

CHEMICAL ANALYSIS

The facility is accredited in accordance with the recognised International Standard

ISO/IEC 17025:2005

The accreditation demonstrates technical competency for a defined scope and the operation of a quality management system

While this certificate remains valid, the Accredited Facility named above is authorised to use the relevant accreditation symbol to issue facility reports and/or certificates

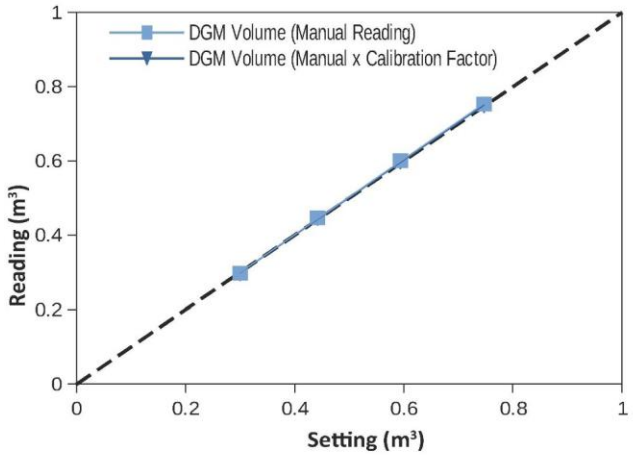
Mr R Josias
Chief Executive Officer

Effective Date: 27 November 2017
Certificate Expires: 01 November 2022

Volumetric Flow Calibration Report

Date of Test: 2021-07-12
Instrument ID: Dado ST5 277 **Reference ID:** Gilibrator High Flow Cell (2 – 30 L/min) & Gilibrator Base
Instrument SN: 4A220180277 **Reference SN:** 2002008-H & 1706017-B

Setting	Duration	Tamb	Pamb	Set Point	Reference Volume	DGM Volume (No-Cal)	DGM Volume (With-Cal)	Post-Cal Error
L/min	min	°C	kPa	m^3				%
10	30	18.0	100.18	0.3000	0.3000	0.2976	0.2959	-1.4
15	30	18.0	100.21	0.4500	0.4422	0.4477	0.4452	0.7
20	30	18.3	100.15	0.6000	0.5940	0.6005	0.5971	0.5
25	30	19.1	99.92	0.7500	0.7473	0.7530	0.7487	0.2



DGM Cal Factor:	0.994

Technician: Xander Oosthuysen **Quality Manager:** Xander Oosthuysen

Signature **Signature**