ChemVi Laboratory Sdn. Bhd. (514202 D)
Tel : 603 51623500 Fax: 603 51623601 e-mail : chemvi@tm.net.my

ISO 14001:2004 Certified

CAR EXHAUST EMISSION MONITORING

At

BAE TRADING SDN BHD
No 9, Jalan 14/108C
Taman Sungai Besi Industrial Area,
57100 Kuala Lumpur,

Malaysia.

Contact: Mr. Mohd Muslim Liew Bin Addullah

Tel: +603-79821669

Fax: +603-79821012

Assessment Date: 15-April-2013

By:

Dr. Shanmugam

CV 2027




1.0 INTRODUCTION

Chemvi Laboratory Sdn. Bhd. was engaged by BAE Trading Sdn. Bhd. to conduct Car Exhaust Emission Monitoring on 15th April 2013 at garage located at BAE Trading Sdn. Bhd. No 9, Jalan 14/108C Taman Sungai Besi Industrial Area, 57100 Kuala Lumpur, Malaysia.

The Monitoring was undertaken by Dr Shanmugam , a registered chemist and registered competent person with the Department of Occupational Safety and Health, Malaysia.

2.0 MAIN OBJECTIVE

a) To evaluate the efficiency of the BAE Progreen in reducing the environmental air contaminants.

3.0 SPECIFIC OBJECTIVES

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a) To determine the air borne concentration level of Carbon Dioxide (CO_2), Carbon Monoxide (CO) and Respirable Particulate.
b) To determine the reduction of these contaminants after BAE Progreen installation.

4.0 MONITORING DETAILS

Details of the monitoring are as follows: -

4.1 DATE OF SAMPLING

15th April 2013

4.2 SAMPLING PERSONNEL

a) Dr. Shanmugam

4.3 PERSON-IN CHARGE

Mr. Michael Liew

4.3 SAMPLING POINT

Marking	Garage – Near Car Exhaust
A1	Base line –Room
A2	Base line- Engine Start without BAE Progreen installation
A3	Engine Start with BAE Progreen installation, time 0 minutes
A4	Engine Running with BAE Progreen installation, time 30 minutes
A5	Engine Running with BAE Progreen installation, time 60 minutes
A6	Engine Running with BAE Progreen installation, time 90 minutes
A7	Engine Running with BAE Progreen installation, time 120 minutes
A8	Engine Running with BAE Progreen installation, time 150 minutes

5.0 METHODOLOGY

5.1 INSTRUMENTATION

The Car Exhaust Emission Monitoring was performed using the following equipment.

Air sampling Pump	: Technovation Air Sampling Pump Model: AS-3 (Sr. AS05001 – AS05016)
Sampling pump calibrator	: Technovation Digital Flow Calibrator Model: PSI-DFC1 (Sr. 48)
Hot wire anemometer	: TSI Incorporated Model 8386- M-GB
DustTRakTH II	: TSI Incorporated Model 8532

Collecting Media and Other accessories are selected as according to the methodology requirement of the chemical sampling and analysis stated in NIOSH (*The National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services)* Manual of Analytical Methods.

Figure 1: BAE Progreen installation

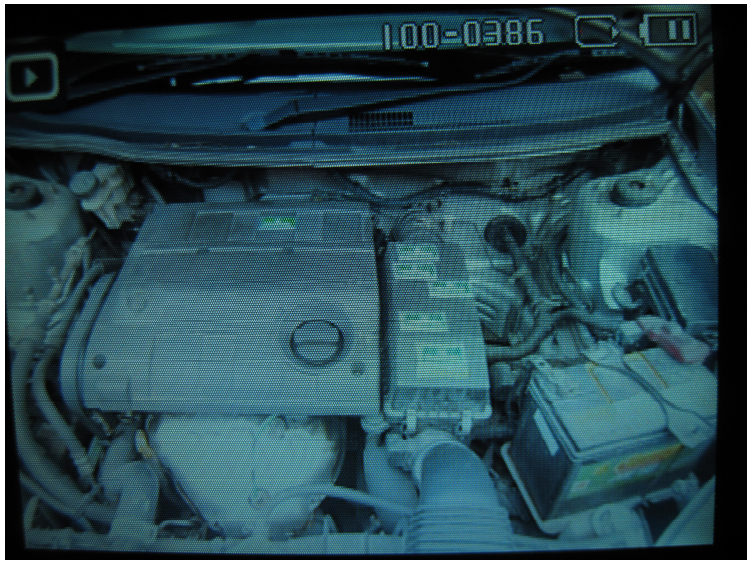


Figure 2: BAE Progreen installation

Figure 3 : Car Exhaust Emission Monitoring

Sampling method and collection media are as follows:-

Test Parameter	**Sampling Method**	**Collection Media**
Carbon Dioxide	NIOSH 6604	PORTABLE DIRECT-READING CO2 MONITOR (Electrochemical Sensor)
Carbon Monoxide	NIOSH 6604	PORTABLE DIRECT-READING CO MONITOR (Electrochemical Sensor)
Respirable Particulate	NIOSH 0600	PORTABLE DIRECT-READING DustTRakTH II- Model

5.2 SAMPLING

Method of air sampling is according to NIOSH Manual of Analytical Methods.

The Sampling Process summarized as follows:-

1) Blank sample is prepared; two sample which is subjected to exactly the same handling conditions except that no air is drawn through the collection media
2) Calibration of sampling pumps;
   The pumps were calibrated to specific flow rate as stated in NIOSH sampling methods. Each sampling pump was calibrated with representative collecting media in line.
3) Briefing was given to the personal working surrounding the monitoring area on purpose Car Exhaust Emission Monitoring.
4) The instruments were attached near to the contamination source (car exhaust).
5) Collected samples were firmly sealed with plugs at both the inlet and outlet point.
6) Sample identities and all relevant sample data were recorded.
7) The collected samples were transported in an air tight container to prevent contamination during transportation
8) The sampling pumps were again calibrated at the end of sampling.

5.3 LABORATORY ANALYSIS

Samples were analyzed in ISO/IEC 17025, SAMM Accredited Laboratory
SAMM Reg. Num: 213

Analysis were carried out by a IKM registered chemist
IKM Reg. Num: AMIC/1095/2640/96/99,

Laboratory Analysis Methodology is based on NIOSH Measurement Method.

Test Parameter	NIOSH Methodology	Measurement Technique
Carbon Dioxide	NIOSH 6604	Gas Analyzer
Carbon Monoxide	NIOSH 6604	Gas Analyzer
Respirable Particulate	NIOSH 0600	Direct Reading

6.0 ENVIRONMENTAL DATA

	Environmental Factors	
	Temperature	Relative Humidity
Point A1	31.2^{o}C	67.4%
Point A2	31.5^{o}C	67.6%
Point A3	32.7^{o}C	64.5%
Point A4	32.7^{o}C	60.4%
Point A5	36.1^{o}C	53.3%
Point A6	34.8^{o}C	55.1%
Point A7	33. ^{o}C	56.8%
Point A8	38.3^{o}C	56.9%

7.0 MONITORING RESULTS

Table 1: Car Exhaust Emission Monitoring at garage located near to car exhaust.

Area	Test Parameter	Results	Maximum Permissible Limit
Point A1	Carbon Dioxide	534 ppm	1000 ppm
	Carbon Monoxide	4.5 ppm	10 ppm
	Respirable Particulate	0.092 mg/m^3	0.15 mg/m^3

Area	Test Parameter	Results	Maximum Permissible Limit
Point A2	Carbon Dioxide	2200 ppm	1000 ppm
	Carbon Monoxide	6.2 ppm	10 ppm
	Respirable Particulate	0.094 mg/m^3	0.15 mg/m^3

Area	Test Parameter	Results	Maximum Permissible Limit
Point A3	Carbon Dioxide	1498 ppm	1000 ppm
	Carbon Monoxide	5.6 ppm	10 ppm
	Respirable Particulate	0.259 mg/m^3	0.15 mg/m^3

Area	Test Parameter	Results	Maximum Permissible Limit
Point A4	Carbon Dioxide	1250 ppm	1000 ppm
	Carbon Monoxide	5.3 ppm	10 ppm
	Respirable Particulate	0.132 mg/m^3	0.15 mg/m^3

Area	Test Parameter	Results	Maximum Permissible Limit
Point A5	Carbon Dioxide	1150 ppm	1000 ppm
	Carbon Monoxide	5.0 ppm	10 ppm
	Respirable Particulate	0.130 mg/m^3	0.15 mg/m^3

Area	Test Parameter	Results	Maximum Permissible Limit
Point A6	Carbon Dioxide	1040 ppm	1000 ppm
	Carbon Monoxide	4.9 ppm	10 ppm
	Respirable Particulate	0.125 mg/m^3	0.15 mg/m^3

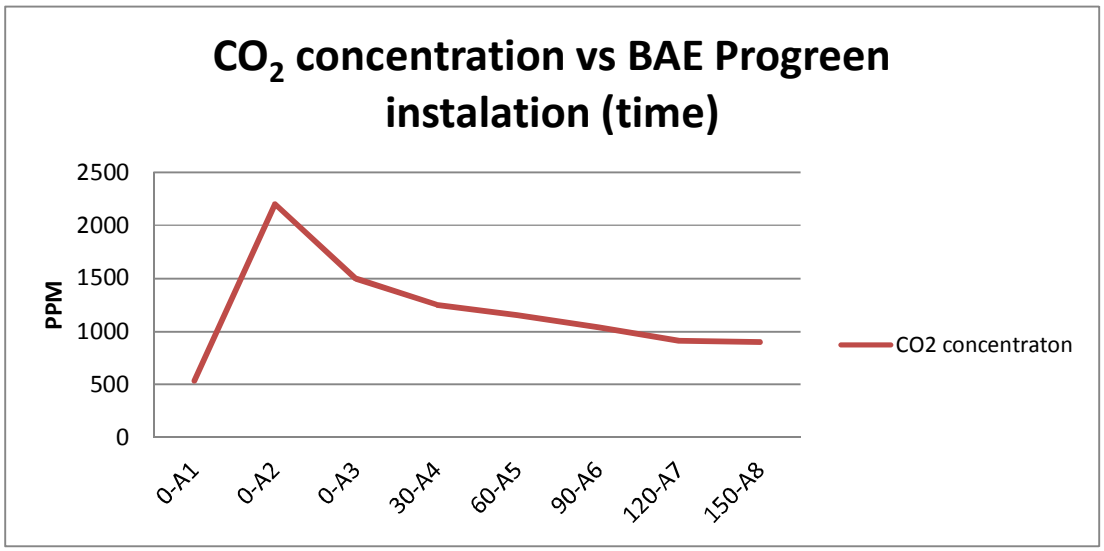
Area	Test Parameter	Results	Maximum Permissible Limit
Point A7	Carbon Dioxide	910 ppm	1000 ppm
	Carbon Monoxide	4.2 ppm	10 ppm
	Respirable Particulate	0.115 mg/m^3	0.15 mg/m^3

Area	Test Parameter	Results	Maximum Permissible Limit
Point A8	Carbon Dioxide	900 ppm	1000 ppm
	Carbon Monoxide	4.1 ppm	10 ppm
	Respirable Particulate	0.118 mg/m^3	0.15 mg/m^3

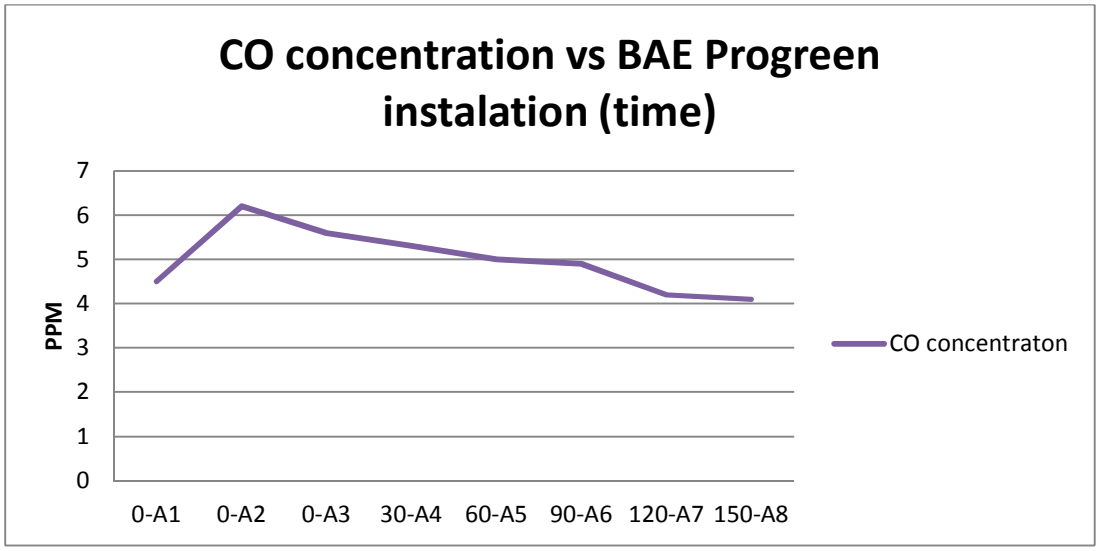
9.0 DISCUSSION

Test Parameter	Point A1	Point A2	Point A3	Point A4	Point A5	Point A6	Point A7	Point A8
Carbon Dioxide	534 ppm	2200 ppm	1498 ppm	1250 ppm	1150 ppm	1040 ppm	910 ppm	900 ppm
Carbon Monoxide	4.5 ppm	6.2 ppm	5.6 ppm	5.3 ppm	5.0 ppm	4.9 ppm	4.2 ppm	4.1 ppm
Respirable Particulate	0.092 mg/m^3	0.094 mg/m^3	0.259 mg/m^3	0.132 mg/m^3	0.130 mg/m^3	0.125 mg/m^3	0.115 mg/m^3	0.118 mg/m^3

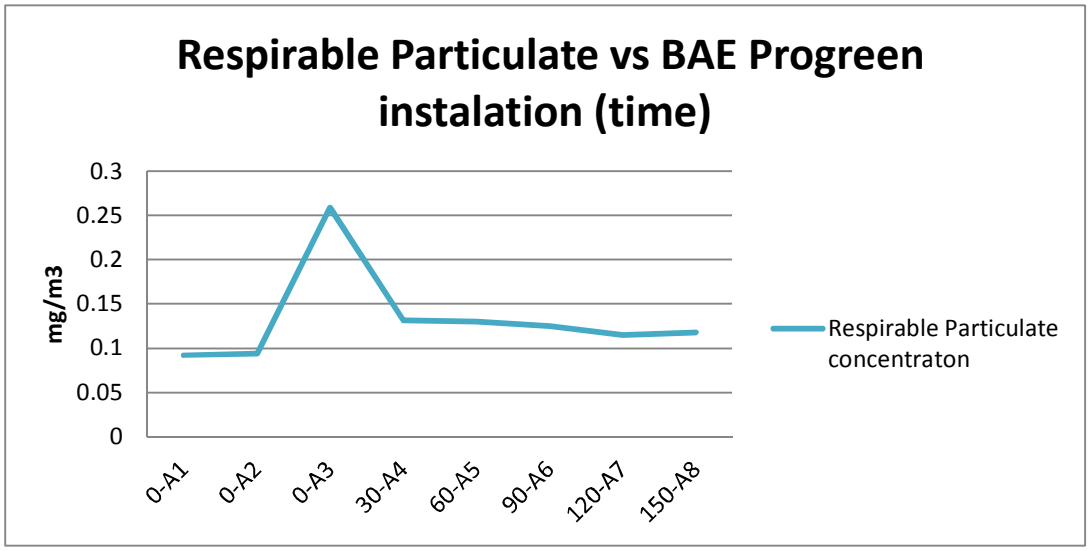
Marking	***Garage – Near Car Exhaust***
A1	*Base line –Room*
A2	*Base line- Engine Start without BAE Progreen installation*
A3	*Engine Start with BAE Progreen installation, time 0 minutes*
A4	*Engine Running with BAE Progreen installation, time 30 minutes*
A5	*Engine Running with BAE Progreen installation, time 60 minutes*
A6	*Engine Running with BAE Progreen installation, time 90 minutes*
A7	*Engine Running with BAE Progreen installation, time 120 minutes*
A8	*Engine Running with BAE Progreen installation, time 150 minutes*



After the installation of BAE Progreen the level of CO_2 emission is reduced to almost 31% immediately whereas after almost two hour of BAE Progreen installation in the vehicle it was found that the level of CO_2 emission from car exhaust is reduced to almost 58% from the original value compared to before the installation of BAE Progreen and the level of CO_2 emission is stabilized after 150 min after installation of BAE Progreen.



Immediately after the installation of BAE Progreen the level of CO emission is reduced to almost 9.6%, and after almost two hours of BAE Progreen installation in the vehicle it was found that the level of CO emission from car exhaust is reduced to almost 32% from the original value compared to before the installation of BAE Progreen and the level of CO emission is stabilized after 150 min after installation of BAE Progreen.



After the installation of BAE Progreen the level of Respirable Particulate emission is increased to 175% immediately whereas after 30min of BAE Progreen installation in the vehicle it was found that the level of Respirable Particulate emission from car exhaust is reduced to almost 49% from the original value. Level of Respirable Particulate emission is reduced and stabilized to 55% from the original value after 120 min of installation of BAE Progreen.

10.0 INFERENCE

The Car Exhaust Emission Monitoring at garage located near to car exhaust was conducted. Onsite and Laboratory results indicate that the BAE Progreen installation in the vehicle is able to reduced CO_2 emission by 58% after 150 min, reduce CO emission by 32% after 150min of application and reduce Respirable Particulate to 55% after 120min of application. The BAE Progreen is effective in reducing the CO_2, CO and Respirable Particulate in the vehicle exhaust.

The monitoring has fulfilled the entire objective set out in the exercise.

Report Prepared,

Yours faithfully

ChemVi Laboratory Sdn. Bhd.

Dr. Shanmugam

Director /Chemist: A/1095/2640/96/99,

MRSC(UK) :ID 474980,

Hygiene Tech I : JKKP HIE 127/171-3/1(163),

Hygiene Tech II: JKKP HIE 127/171-3/2(60),

CHRA Assessor: JKKP HIE 127/171-2(280),

BOHS P-406: Cert No. 180111/004 (UK)

British Occupational Hygiene Society

Faculty of Occupational Hygiene

Shanmugam Suberamaniam

has satisfactorily completed the examination process and has duly been awarded the

Proficiency Certificate

in

P406 - Supervision and Management of the Safe Removal and Disposal of Asbestos

THE BRITISH OCCUPATIONAL HYGIENE SOCIETY

Chief Examiner

December 2010
Certificate No. 180111/004

Working for a healthier workplace

Singapore Environment Institute
A division of National Environment Agency

MINISTRY OF MANPOWER

CERTIFICATE

This is to certify that

SHANMUGAM SUBERAMANIAM

A1455674I

has completed a course of study on

ASBESTOS REMOVAL AND MANAGEMENT COURSE

from 6 SEP 2007 to 7 SEP 2007

and passed the examination

required for the certificate

ONG ENG KIAN
Director
Singapore Environment Institute
National Environment Agency

DR HO SWEET FAR
Director (OSH Specialist)
Occupational Safety and Health Division
Ministry of Manpower

STANDARDS MALAYSIA
ACCREDITED LABORATORY

MS ISO/IEC 17025

Certificate of Accreditation

No: SAMM 213 Valid until: 27 July 2014

This is to certify that

CHEMVI LABORATORY SDN. BHD.,
KLANG, SELANGOR
MALAYSIA

(FIELDS OF TESTING: CHEMICAL)

has been granted accreditation in respect of the scope of accreditation described in the SCHEDULE attached, subject to the terms and conditions governing the *Skim Akreditasi Makmal Malaysia* (SAMM), the Laboratory Accreditation Scheme of Malaysia.

Laboratories accredited under SAMM meet the requirements of MS ISO/IEC 17025 'General requirements for the competence of testing and calibration laboratories'. This Malaysian Standard is identical with ISO/IEC 17025 published by the International Organization for Standardization (ISO).

"This laboratory is accredited in accordance with recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communique dated 18 June 2005)"

(FADILAH BAHARIN)
Director General
Department of Standards Malaysia

Date of issue: 5 July 2011

Founded 1841
Incorporated by Royal Charter 1848
Patron Her Majesty the Queen

THIS IS TO CERTIFY THAT

SUBERAMANIAM SHANMUGAM

HAS BEEN ADMITTED AS A

MEMBER

OF

THE ROYAL SOCIETY OF CHEMISTRY

and is entitled to use the designatory letters MRSC

President

Chief Executive

Date of admission

30 September 2011

Membership Number

474980

The certificate is issued subject to the provisions of the Charter and By-Laws
Registered Charity Number 207890

Borang 5 Kaedah 23 (2)
Form Rule

PERAKUAN PENGEKALAN TAHUNAN
ANNUAL RETENTION CERTIFICATE

Maka inilah diperakui bahawa
This is to certify that

Shanmugam a/l Suberamaniam, Dr.
(Nama penuh) *(Name in full)*

beralamat *of (Address)* **Chemvi Laboratory Sdn Bhd, No.5A-B Lrg. Temenggung 15A, Tmn. Evergreen, 41200 Klang, Selangor**

yang didaftarkan di bawah Akta Ahli Kimia 1975, dan yang Perakuan Pendaftarannya bernombor **A/1095/2640/96/99**

who is registered under the Chemists Act 1975, and whose Certificate of Registration bears the Number

telah dikekalkan dalam daftar anggota-anggota Institut Kimia Malaysia sehingga 31 haribulan Disember **2013**

has been retained on the register of members of the Malaysian Institute of Chemistry until 31st December

Dikeluarkan pada **13 Disember 2012**
Issued this

Pendaftar,
Institut Kimia Malaysia.
Registrar,
Malaysian Institute of Chemistry.

Bayaran sebanyak RM 100 telah dibayar
Fee RM 100 paid.

P 0234

MALAYSIA

AKTA KESELAMATAN DAN KESIHATAN PEKERJAAN 1994

PERATURAN-PERATURAN KESELAMATAN DAN KESIHATAN PEKERJAAN (PENGGUNAAN DAN STANDARD PENDEDAHAN BAHAN KIMIA BERBAHAYA KEPADA KESIHATAN) 2000

Adalah disahkan bahawa

SHANMUGAM A/L SUBERAMANIAM
(K.P.: 700711-08-6283)

telah didaftarkan dengan Ketua Pengarah
Jabatan Keselamatan dan Kesihatan Pekerjaan Malaysia

sebagai

PENGAPIT

No. Rujukan Pendaftaran : JKKP HIE 127/171-2(280)

Pendaftaran sah dari 02 Sept. 2010 sehingga 01 Sept. 2013*

Tarikh: 14.10.10

(Dato' Ir. Dr. Johari Basri)
Ketua Pengarah
Jabatan Keselamatan dan Kesihatan Pekerjaan
Malaysia

*(sila lihat muka sebelah untuk tarikh pembaharuan sijil)

H 0299

MALAYSIA

AKTA KESELAMATAN DAN KESIHATAN PEKERJAAN 1994

PERATURAN-PERATURAN KESELAMATAN DAN KESIHATAN PEKERJAAN (PENGGUNAAN DAN STANDARD PENDEDAHAN BAHAN KIMIA BERBAHAYA KEPADA KESIHATAN) 2000

Adalah disahkan bahawa

SHANMUGAM A/L SUBERAMANIAM
(K.P.: 700711-08-6283)

telah didaftarkan dengan Ketua Pengarah
Jabatan Keselamatan dan Kesihatan Pekerjaan Malaysia

sebagai

JURUTEKNIK HIGIEN I

untuk

kerja-kerja pemantauan bahan kimia
berbahaya kepada kesihatan

No. Rujukan Pendaftaran : JKKP HIE 127/171-3/1(163)

Pendaftaran sah dari 30 Nov. 2010 sehingga 29 Nov. 2013*

Tarikh: 21.12.10

(Dato' Ir. Dr. Johari Basri)
Ketua Pengarah
Jabatan Keselamatan dan Kesihatan Pekerjaan
Malaysia

{sila lihat muka sebelah untuk tarikh pembaharuan sijil}

H 0162

MALAYSIA

AKTA KESELAMATAN DAN KESIHATAN PEKERJAAN 1994

PERATURAN-PERATURAN KESELAMATAN DAN KESIHATAN PEKERJAAN (PENGGUNAAN DAN STANDARD PENDEDAHAN BAHAN KIMIA BERBAHAYA KEPADA KESIHATAN) 2000

Adalah disahkan bahawa

SHANMUGAM A/L SUBERAMANIAM
(K.P.: 700711-08-6283)

telah didaftarkan dengan Ketua Pengarah
Jabatan Keselamatan dan Kesihatan Pekerjaan Malaysia

sebagai

JURUTEKNIK HIGIEN II

untuk

kerja-kerja pemeriksaan dan pengujian
keatas kelengkapan kawalan kejuruteraan

No. Rujukan Pendaftaran : JKKP HIE 127/171-3/2 (60)

Pendaftaran sah dari 30 Mei 2008 sehingga 29 Mei 2011*

Tarikh: 24.6.08

(Dato' Ir. Dr. Johari Basri)
Ketua Pengarah
Jabatan Keselamatan dan Kesihatan Pekerjaan
Malaysia

{sila lihat muka sebelah untuk tarikh pembaharuan sijil}

MIHA
Malaysian Industrial Hygiene Association

MALAYSIAN INDUSTRIAL HYGIENE ASSOCIATION

DR SHANMUGAM A/L SUBERAMANIAM

has been certified

ASSOCIATE MEMBER (#A0314-10)

of this Association, formed to lead in the promotion of Industrial Hygiene and foster professional development of its members

Witness the signatures of its authorized officers

President

Honorary Secretary

Original date of membership April 2010