



27-Oct-2016

Your Ref: (6) in EP2/H4/S3/15 Pt. 37
Our Ref: H2613-LJV-EN-LE-4229

The EIA Ordinance Register Office
Environmental Protection Department
27/F, Southorn Centre
130 Hennessy Road
Wan Chai, Hong Kong

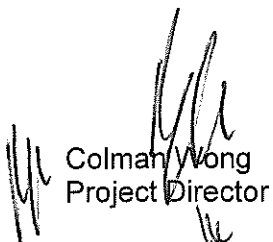
Dear Sir,

Contract No. HY/2011/08
Central-Wan Chai Bypass – Tunnel Buildings, Systems and Fittings, and Works
Associated with Tunnel Commissioning
Operational Air Quality Management Plan – EP2.13(e) Zero Portal Emission Design

Pursuant to Condition 2.13(e) of the Environmental Permit no. FEP-11/364/2009/B and referring to your captioned letter, we enclose four hard copies and one electronic copy for the captioned submission with ET's certification letter and IEC's verification letter for your information.

Should you have any query, please do not hesitate to contact our Mr. Malcolm Leung at 6323 9478, or malcolm.leung@leightonasia.com.

Yours faithfully
For and on behalf of
Leighton Joint Venture


Colman Wong
Project Director

CW / PT / ML / CTS

Encl.

c.c. AECOM - Mr. David Kwan, CRE (CD only)
LAM - Mr. Raymond Dai, ETL (CD only)
ENVIRON - Mr. David Yeung, IEC (CD only)

LEIGHTON



Contract No. HY/2011/08
Central-Wan Chai Bypass – Tunnel Building, Systems and
Fittings, and Works Associated with Tunnel Commissioning

**Operational Air Quality Management Plan –
EP2.13(e) Zero Portal Emission Design**

Prepared by:

A handwritten signature in blue ink, appearing to be 'Malcolm Leung', written over a horizontal line.

Malcolm Leung
Environmental Officer

Approved by:

A handwritten signature in black ink, appearing to be 'Colman Wong', written over a horizontal line.

Colman Wong
Site Agent



Lam Geotechnics Limited

Ground Investigation & Instrumentation Professionals

華益土力有限公司

Ref : G1525/CS/L251/LJV
Date : 19 October 2016

Leighton Joint Venture
39/F Sun Hung Kai Centre
30 Harbour Road
Wan Chai

Attn: Site Agent, Mr. Colman Wong

Dear Mr. Wong,

Contract No. HY/2011/08
Central-Wanchai Bypass – Tunnel Buildings, Systems and Fittings, and Works Associated with Tunnel Commissioning

Operational Air Quality Management Plan (Zero Portal Emission Design) Rev.0

Referring to the captioned submission dated 17 August 2016 received through email on 17 August 2016, we have reviewed your submitted details and hereby certified this submission in accordance with Condition 2.13 (e) of FEP-11/364/2009/B.

Should you have any enquiry, please feel free to contact the undersigned at 2839 5666.

Yours faithfully,

Raymond Dai
Environmental Team Leader

C.C.

HyD	- Mr. Eddy Wu	(By Fax: 2714 5289)
AECOM	- Mr. Peter Poon	(By Fax: 3912 3090)
AECOM	- Mr. Frankie Fan	(By Fax: 2587 1877)
Ramboll Environ	- Mr. David Yeung	(By Fax: 3548 6988)



Ref.: AACWBIECEM00_0_8663L.16

25 October 2016

By E-mail

Leighton Joint Venture
39/F, Sun Hung Kai Centre
30 Harbour Road
Hong Kong

Attention: Site Agent, Mr. Colman Wong

Dear Mr. Wong,

Re: Contract No. HY/2011/08
Central – Wan Chai Bypass – Tunnel Buildings, Systems and Fittings,
and Works Associated with Tunnel Commissioning
Operational Air Quality Management Plan (Zero Portal Emission Design)
(Revision 0)

Reference is made to the captioned submission received on 17 August 2016.

Please be informed that we have no comments on the captioned submission. We write to verify it in accordance with Condition 2.13 (e) of FEP-11/364/2009/B.

Thank you for your kind attention.

Yours sincerely,



David Yeung
Independent Environmental Checker

c.c.	HyD	Mr. Eddy Wu	by fax: 2714 5289
	AECOM	Mr. Peter Poon	by fax: 3912 3010
	AECOM	Mr. Frankie Fan	by fax: 2587 1877
	LAM	Mr. Raymond Dai (ETL)	by fax: 2882 3331

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Operational Air Quality Management Plan – EP2.13(e)

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Appendices

Appendix A	Tunnel Ventilation System – Overall TVS Schematic
Appendix B	TVS Mode Table – Normal / Congested Operation (Uni-directional)

Revision	Date	Section/Description	Prepared	Reviewed	Authorised by
00	17.08.2016	Initial Revision	Malcolm Leung	Malcolm Leung	Colman Wong

1. BACKGROUND

- 1.1.1 To comply with the Condition 2.13(e) under Environmental Permit number: FEP-11/364/2009/B, an Operational Air Quality Management Plan (hereinafter referred to as “this plan”) is prepared to demonstrate:
- *“the ventilation system of the Eastern Portal of the CWB Tunnel shall follow the zero portal emission design as described in Section 2.4.18 of the WDII&CWB EIA Report (Register No. AEIAR-125/2008).”*
- 1.1.2 This plan provides the EIA’s concepts and the design intent, which are implemented by the contract of the Central - Wan Chai Bypass - Tunnel Building, Systems and Fittings and Works Associated with Tunnel Commissioning (Contract No. HY/2011/08, hereinafter referred to as “the CWB-CC”).
- 1.1.3 Leighton Joint Venture (the Contractor, hereinafter referred to as “LJV”) has been awarded for the construction of the CWB-CC. LJV would build the ventilation system according to the relevant requirements.

2. TUNNEL VENTILATION SYSTEM

- 2.1.1 The tunnel ventilation system is to maintain the air clean and remove air pollutants inside tunnel.
- 2.1.2 The ventilation system of the Eastern Portal of the CWB Tunnel shall follow the zero portal emission design as described in Section 2.4.18 of the WDII&CWB EIA Report (Register No. AEIAR-125/2008).

2.2 Zero Portal Emission Design (ZPED)

- 2.2.1 Footnote 2 of the Section 2.4.18 defined the meaning of Zero Portal Emission Design (ZPED), which is applicable to the CWB project.
- 2.2.2 *“For a typical unidirectional tunnel, tunnel traffic will create piston effect which will draw outside air from entry portal and drives the induced air to exit portal. Tunnel ventilation system will induce additional outside air to satisfy minimum air quality standard inside the tunnel in the event that piston effect alone is not able to induce adequate outside air to ventilate the tunnel. The tunnel air both induced by tunnel traffic and brought by tunnel ventilation system will escape through exit portal if no extraction system is provided upstream of the exit portal. If a powerful extraction system is provided upstream of the exit portal to extract all the polluted air, it is possible to have a system with “zero portal emission”. The amount of air flow into the tunnel induced by traffic piston effect can be predicted by using the SES (subway environmental simulation) programme under all modes of traffic conditions. The portal extraction system will be designed with over capacity (about 20%) to cover the worst traffic scenario to ensure that no polluted tunnel air will escape through the exit portal. The extraction system will operate at reduced capacity to cover other scenarios when the emission rate of traffic induced air to exit portal is less than the maximum.*
- 2.2.3 *The current ventilation system proposed for the CWB project consists of three extraction fans for the eastern tunnel portal. Two fans will be adequate to extract all polluted air from the upstream tunnel section of the exit portal. The third fan would be used as standby in case one fan is under maintenance or out of order. Airflow direction sensor will be installed at the exit portal to monitor the airflow direction of the tunnel. This sensor will be used to control the operation of tunnel portal extraction system to ensure that the target of “zero portal emission” will be met. For reference, similar “zero portal emission” design has been adopted in Sydney M5 East Tunnel.”*
- 2.2.4 According to the Appendix 3.15 of the EIA Report, each fan was designed with the capacity of 125m³/s.

2.3 Design Intent of the Eastern Portal for the CWB Project

- 2.3.1 There are eastbound and westbound unidirectional tunnels at the Eastern Portal, which are separated by middle wall. Under normal operation, the eastbound tunnel portal is the exit portal of the Eastern Portal. Airflow direction sensor is installed to monitor the airflow direction of the tunnel for controlling fan group(s). The westbound

Operational Air Quality Management Plan – EP2.13(e)

tunnel portal is the entry portal and according to the abovementioned ZPED, continuous tunnel traffic will naturally draw outside air towards inside the tunnel.

- 2.3.2 Totally six nos. of fans with the capacity of 125m³/s each are installed for ventilation of the CWB eastern part tunnel. Polluted air is extracted through overhead ventilation duct and conveyed into the Air Purification System (APS) for treatment located at the East Ventilation Building and discharged via the East Ventilation Shaft (EVS). The Working Drawing ref. 60095653/RW/4121A (**Appendix A**) shows the schematic diaphragm of the tunnel ventilation system.
- 2.3.3 Extracted from the Working Drawing ref. 60095653/RW/4131B (**Appendix B**), the operation mode table of the tunnel ventilation system during normal/congested operation is shown in **Table 2.1**.

Table 2.1 TVS Mode Table: Normal / Congested Operation (Unidirectional)

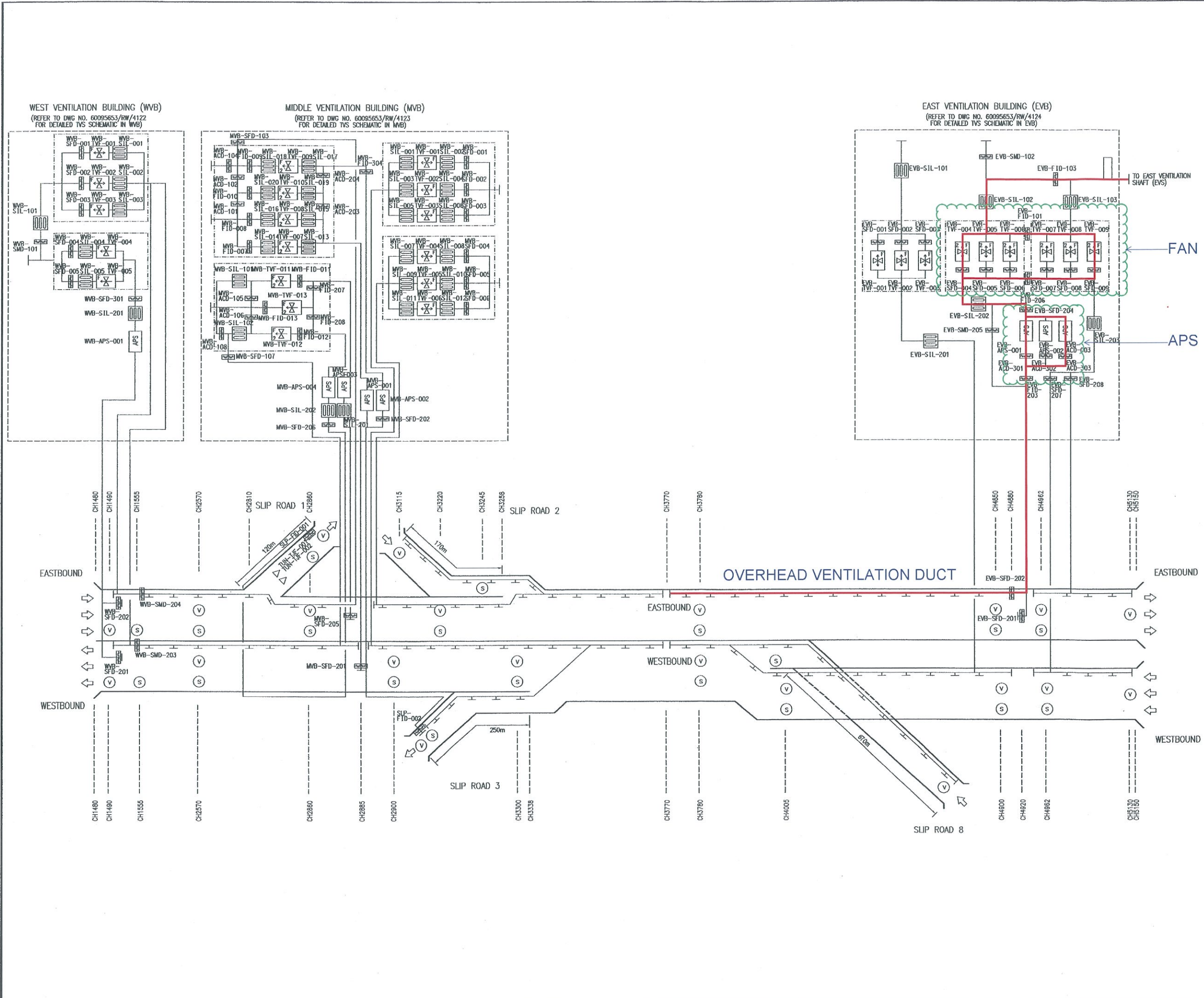
Tunnel Section	Tunnel Condition		Ventilation Level	Fan Group					
	Level Up	Level Down		EVB-TVF-					
				004	005	006	007	008	009
Eastbound Tunnel at Eastern Portal	Air Flow Velocity >0m/s towards Portal	Air Flow Velocity >1m/s towards Tunnel	5	ON	ON	OFF	ON	ON	ON
			4	ON	OFF	OFF	ON	ON	ON
			3	OFF	OFF	OFF	ON	ON	ON
			2	OFF	OFF	OFF	ON	ON	OFF
			1	OFF	OFF	OFF	ON	OFF	OFF
			0	OFF	OFF	OFF	OFF	OFF	OFF

- 2.3.4 According to the TVS Mode Table, ventilation levels up when air flow velocity is greater than 0m/s towards the Eastern Portal until the ventilation level 5 meets; and ventilation levels down when air flow velocity is greater than 1m/s towards the tunnel from the Eastern Portal until all fans are shut down. In addition, ventilation level would be maintained if the air flow velocity is between 0m/s and 1m/s towards the tunnel from the Eastern Portal.
- 2.3.5 To protect the tunnel ventilation system and the air purification system, the tunnel operator would provide an alternative ventilation mode during maintenance and emergency operation (eg. Equipment failure, fire incident, etc.).

3. CONCLUSION

- 3.1.1 Footnote 2 of the Section 2.4.18 defined the meaning of Zero Portal Emission Design (ZPED), which is applicable to the CWB project. *Two fans will be adequate to extract all polluted air from the upstream tunnel section of the exit portal.*
- 3.1.2 The current design intent is that six nos. of fans with the capacity of 125m³/s each are installed for ventilation of the CWB eastern part tunnel, inclusive of one no. standby fan. When the TVS mode meets ventilation level no. 5, five nos. of fans are in operation for extracting polluted air from the upstream tunnel section of the exit portal.
- 3.1.3 It is considered that the current design intent complies with the Condition 2.13(e) under Environmental Permit number: FEP-11/364/2009/B - *“the ventilation system of the Eastern Portal of the CWB Tunnel shall follow the zero portal emission design as described in Section 2.4.18 of the WDII&CWB EIA Report (Register No. AEIAR-125/2008).”*

Appendix A Tunnel Ventilation System – Overall TVS Schematic



- NOTES:**
- FOR LEGEND, GENERAL NOTES AND ABBREVIATIONS, REFER TO DRAWING NO. 60095653/RW/4100
 - THE TUN-SIL-001 TO 004 WILL BE INSTALLED IN FRONT AND BEHIND THE TUN-TJF-001 AND TUN-TJF-002, RESPECTIVELY.

A	WORKING DRAWING	XYM	ALCF	MAR 14
-	TENDER DRAWING	XYM	ALCF	MAY 13

Highways Department 路政署
Major Works Project Management Office

CENTRAL - WAN CHAI BYPASS AND IEC LINK

PWP ITEM NO. 579 TH
工務計劃項目編號

CENTRAL - WAN CHAI BYPASS -
TUNNEL BUILDINGS, SYSTEMS AND FITTINGS,
AND WORKS ASSOCIATED WITH TUNNEL COMMISSIONING
**TUNNEL VENTILATION SYSTEM
OVERALL TVS SCHEMATIC**

AECOM

DRG.NO. 60095653/RW/4121A
圖紙編號

DESIGNED BY XYM	CONTRACT NO. HY/2011/08	BY APPROVED CWN
DRAWN BY DWT	STATUS WORKING DRAWING	
SCALE NTS	© COPYRIGHT RESERVED 版權所有	
DIMENSIONS ARE IN METRES		

Plot File \$USERS\$ \$DATE\$ \$FILE\$

Appendix B TVS Mode Table – Normal / Congested
Operation (Uni-directional)

