

**Environmental Permit No. EP-364/2009**

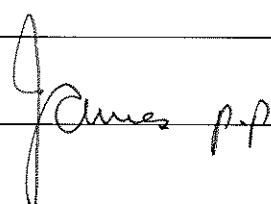
**Noise Baseline Monitoring Report**

22 April 2010

# Chung Shun Boring Eng. Co., Ltd.

Contract No. HK/2009/04  
Wan Chai Development Phase II and  
Central – Wan Chai Bypass –  
Baseline Sampling, Field Measurement and  
Testing Works

## Baseline Noise Monitoring Report (for EP-364/2009)

	Name	Signature
Prepared by:	Chung Shun Boring Eng. Co. Ltd.	-
Certified by:	Environmental Team Leader – Mr. Andy W L Chung	

22 April 2010

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## EXECUTIVE SUMMARY

The baseline noise monitoring was carried out at all designated noise monitoring locations described in the updated EM&A Manual between 4 December 2009 and 17 December 2009. For baseline noise levels, continuous  $L_{eq}$  (5-minutes) were recorded. There was no major activity or extreme weather influencing the measured noise level during the baseline noise monitoring period.

The averaged baseline noise levels are summarized in the following table:

Noise Monitoring Location	M1a	M2a	M4a	M7a
Averaged baseline noise level during 0700-1900hrs on normal weekdays, (dB(A))	69.2	73.7	68.6	65.5
Averaged baseline noise level for all days during evening (1900-2300hrs), and general holidays (including Sundays) during the daytime and evening (0700-2300hrs), (dB(A))	60.1	67.7	63.7	57.9
Averaged baseline noise level for all days during the nighttime (2300-0700hrs), (dB(A))	57.2	65.3	60.9	54.8

## **1 INTRODUCTION**

### **1.1 Background**

1.1.1 The Project, “Design and Construction of Central – Wan Chai Bypass and Island Eastern Corridor Link”, involves the construction and operation of a trunk road that connects the Rumsey Street Flyover Extension (Route 7) and the Island Eastern Corridor (Route 8) to form an east-west strategic route along the Central and Wan Chai Reclamation.

1.1.2 The scope of the CWB includes:

- an interchange (the Central Interchange) with slip roads to the distributor road system on the Central Reclamation Phase I (CRI);
- a dual three-lane trunk road tunnel approximately 2.3 km in length between Central and Causeway Bay forming the Central – Causeway Bay Tunnel, with an eastbound exit to the Hong Kong Convention and Exhibition Centre (HKCEC) Area;
- two separate two-lane single-way tunnels about 0.7 km in length from the Hong Kong Convention and Exhibition Centre (HKCEC) to Causeway Bay forming the Wan Chai Bypass; and
- tunnel control buildings, ventilation buildings, operations areas and parking for operation, maintenance and recovery vehicles.

1.1.3 The scope of the IECL includes:

- a dual four-lane trunk road about 1 km in length linking the CWB and the Island Eastern Corridor;
- slip roads from the trunk road connecting to Victoria Park Road and Hing Fat Street;
- realignment of Victoria Park Road eastbound and provision of road connections to the reclamation area; and
- associated road lighting, road signing, traffic control and surveillance systems.

1.1.4 Some of the works of the CWB & IECL will be constructed on land reclaimed under Territory Development Department (TDD) projects CRIII and WDII. In order to minimise the construction interface with these projects, the construction of tunnel box structure within the CRIII and WDII areas are proposed to be entrusted to TDD’s CRIII and WDII projects, respectively. Apart from the entrusted works, the works of the CWB & IECL will be divided into three work packages and constructed by HyD’s contractors. All work packages for the CWB & IECL are summarised as follows:

- Entrusted Works in CRIII Area
- Entrusted Works in WDII Area
- Central Interchange
- IECL
- Tunnel Building, E&M Installation and Ancillary Works (including the overall E&M works and tunnel cladding works in CRIII and WDII areas)

### **1.2 Purpose of Baseline Noise Monitoring Report**

1.2.1 The purpose of this report is to review the baseline conditions of noise levels at the Project site.

1.2.2 This baseline monitoring report presents the baseline monitoring requirements, methodologies and monitoring results at 4 noise monitoring locations described in the updated EM&A Manual.

1.2.3 The baseline monitoring results for air quality will be presented in the individual baseline monitoring report.

## 2 NOISE MONITORING

### 2.1 Monitoring Requirements

2.1.1 In accordance with the updated EM&A Manual, baseline noise monitoring at 4 monitoring locations was conducted, for consecutively 14 days, to obtain background noise levels at the area.

### 2.2 Monitoring Equipment

2.2.1 Noise monitoring was performed using sound level meter at each designated monitoring locations. The sound level meters deployed comply with the International Electrotechnical Commission Publications (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications. Acoustic calibrator was deployed to check the sound level meters at a known sound pressure level. Brand and model of the equipment is given in **Table 2.1**.

**Table 2.1 Noise Monitoring Equipment**

Equipment	Brand and Model
Integrated Sound Level Meter	B&K (Model No. 2238)
	B&K (Model 2250L)
	Rion (Model NL-31)
Acoustic Calibrator	B&K (Model No. 4231)
	Rion NC-73

### 2.3 Monitoring Locations

2.3.1 In accordance with the updated EM&A Manual, the noise monitoring stations for baseline noise monitoring is presented in **Table 2.2** and shown in **Figure 2.1**.

**Table 2.2 Baseline Noise Monitoring Stations**

Monitoring Location	Description	Level (in terms of no. of floor)
M1a	Harbour Road Sports Centre	3 (roof-top)
M2a	Caltex Petrol Filling Station	2 (roof-top)
M4a	Causeway Bay Community Centre	4
M7a	Harbour Building	27 (roof-top)

### 2.4 Monitoring Parameters, Frequency and Duration

2.4.1 The monitoring parameters, frequency and duration of noise monitoring are summarized in **Table 2.3**.

**Table 2.3 Noise Monitoring Parameters, Frequency and Duration**

Time Period	Duration, min	Parameters
0700-1900 hrs on normal weekdays	$L_{eq}(30\text{-min})$	$L_{eq}$
Time period other than 0700-1900 hrs on normal weekdays	$L_{eq}(5\text{-min})$	

## 2.5 Monitoring Methodology

### 2.5.1 Monitoring Procedure

- (a) Façade measurements were made at all monitoring locations.
- (b) The battery condition was checked to ensure the correct functioning of the meter.
- (c) Parameters such as frequency weighting, the time weighting and the measurement time were set as follows:
  - (i) frequency weighting: A
  - (ii) time weighting: Fast
  - (iii) time measurement:  $L_{eq}(30\text{-minutes})$  were recorded for the period between 0700 and 1900 hours on normal weekdays. For all other time periods,  $L_{eq}(5\text{-minutes})$  were recorded.
- (d) Prior to and after each noise measurement, the meter was calibrated using the acoustic calibrator for 94dB(A) at 1000 Hz. If the difference in the calibration level before and after measurement was more than 1 dB(A), the measurement would be considered invalid and repeat of noise measurement would be required after re-calibration or repair of the equipment.
- (e) Noise monitoring was cancelled in the presence of fog, rain, wind with a steady speed exceeding 5m/s, or wind with gusts exceeding 10m/s.

### 2.5.2 Maintenance and Calibration

- (a) The microphone head of the sound level meter was cleaned with soft cloth at regular intervals.
- (b) The meter and calibrator were sent to the supplier or Soils and Materials Engineering Co. Ltd. to check and calibrate at yearly intervals.
- (c) Calibration certificates of the sound level meters and acoustic calibrators are provided in **Appendix A**.

## 2.6 Results and Observations

- 2.6.1 There was no other major activity influencing the measured noise level during the baseline noise monitoring period. The dominant noise sources were from community noises, school activities and nearby traffic emissions.
- 2.6.2 Baseline noise monitoring was conducted for consecutively 14 days, from 4 December 2009 to 17 December 2009.
- 2.6.3 The baseline noise monitoring results are summarized in **Table 2.4, 2.5 and 2.6**. Detailed noise monitoring results are presented in **Appendix B**.

**Table 2.4 Summary of Baseline Noise Monitoring Results (0700-1900 hrs on normal weekdays)**

0700-1900 hrs of normal weekdays	$L_{eq}(30\text{-min}), d(B)A$	
	Average	Range
M1a	69.2	68.4 – 70.4
M2a	73.7	72.7 – 74.5
M4a	68.6	67.2 – 69.6
M7a	65.5	64.7 – 67.0

**Table 2.5 Summary of Baseline Noise Monitoring Results (all days during evening (1900-2300hrs), and general holidays (including Sundays) during the daytime and evening (0700-2300hrs))**

All days during evening (1900-2300hrs), and general holidays (including Sundays) during the daytime and evening (0700-2300hrs)	$L_{eq}(5\text{-min}), d(B)A$	
	Average	Range
M1a	60.1	56.8 - 66.4
M2a	67.7	64.1 - 69.7
M4a	63.7	60.9 - 67.2
M7a	57.9	55.0 - 61.7

**Table 2.6 Summary of Baseline Noise Monitoring Results (all days during the nighttime (2300-0700hrs))**

All days during the nighttime (2300-0700hrs)	$L_{eq}(5\text{-min}), d(B)A$	
	Average	Range
M1a	57.2	54.1 - 63.0
M2a	65.3	62.2 - 67.6
M4a	60.9	57.7 - 63.4
M7a	54.8	52.6 - 58.7



## 2.7 Event and Action Levels

- 2.7.1 The Action and Limit Levels of noise monitoring have been set in accordance with the derivation criteria specified in the updated EM&A Manual as shown in **Table 2.7** below.

**Table 2.7 Action and Limit Levels for Construction Noise**

<b>Time Period</b>	<b>Action Level</b>	<b>Limit Level</b>
0700 – 1900 hours on normal weekdays	When one documented complaint is received	75 dB(A) *

Notes: If works are to be carried out during restricted hours, the conditions stipulated in the Construction Noise Permit (CNP) issued by the Noise Control Authority have to be followed.

\* 70 dB(A) and 65 dB(A) for schools during normal teaching periods and school examination periods, respectively.

## 2.8 Event and Action Plan

2.8.1 Should non-compliance of the criteria occur, action in accordance with the Event and Action Plan in **Table 2.8** shall be implemented.

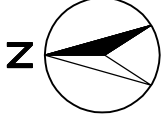
**Table 2.8 Event/Action Plan for Construction Noise**

EVENT			ACTION			
			ET	IEC	ER	CONTRACTOR
Action Level being exceeded	1. Notify ER, IEC and Contractor; 2. Carry out investigation; 3. Report the results of investigation to the IEC, ER and Contractor; 4. Discuss with the IEC and Contractor on remedial measures required; 5. Increase monitoring frequency to check mitigation effectiveness.  (The above actions should be taken within 2 working days after the exceedance is identified)	1. Review the investigation results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; 3. Advise the ER on the effectiveness of the proposed remedial measures.  (The above actions should be taken within 2 working days after the exceedance is identified)	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Supervise the implementation of remedial measures.  (The above actions should be taken within 2 working days after the exceedance is identified)	1. Submit noise mitigation proposals to IEC and ER; 2. Implement noise mitigation proposals.  (The above actions should be taken within 2 working days after the exceedance is identified)		
Limit Level being exceeded	1. Inform IEC, ER, Contractor and EPD; 2. Repeat measurements to confirm findings; 3. Increase monitoring frequency; 4. Identify source and investigate the cause of exceedance; 5. Carry out analysis of Contractor's working procedures; 6. Discuss with the IEC, Contractor and ER on remedial measures required; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.  (The above actions should be taken within 2 working days after the exceedance is identified)	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly.  (The above actions should be taken within 2 working days after the exceedance is identified)	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Supervise the implementation of remedial measures; 5. If exceedance continues, consider stopping the Contractor to continue working on that portion of work which causes the exceedance until the exceedance is abated.  (The above actions should be taken within 2 working days after the exceedance is identified)	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification; 3. Implement the agreed proposals; 4. Submit further proposal if problem still not under control; 5. Stop the relevant portion of works as instructed by the ER until the exceedance is abated.  (The above actions should be taken within 2 working days after the exceedance is identified)		

### **3 CONSLUSIONS AND RECOMMENDATIONS**

- 3.1.1 Baseline noise monitoring was carried out from 4 December to 17 December 2009 at 4 monitoring locations. The Action Level of construction noise is based on documented complaints received, while the Limit Level is the level at a specific limit according to EIAO-TM. No recommendation was provided in this baseline noise monitoring report.

**Figure**



Designated Project	Noise Monitoring Station	Description	Use
DP1, DP2, DP3, DP5	M1a	Harbour Road Sports Centre	Sport Facilities
DP1, DP3	M2a	Caltex Petrol Filling Station	Petrol Filling Facilities
DP1, DP3	M3	Mayson Garden	Residential
DP1, DP3	M4a	Causeway Bay Community Centre	Government Facilities
DP1, DP3	M5a	Electric Centre	Utility Facilities
DP1, DP3	M6	Hong Kong Baptist Church Henrietta Secondary School	Educational Institute
-	M7a	Harbour Building	Government Facilities



**LEGEND:**

- M1-M6 CONSTRUCTION NOISE MONITORING STATIONS
- \* NEWLY PROPOSED NOISE MONITORING STATION FOR REPLACEMENT OF ORIGINALLY PROPOSED STATION
- ▲ NOISE MONITORING STATION AS PER EIA NO. AEIAR-041/2001
- 300M STUDY BOUNDARY

# **Appendix A**

Calibration Certificates of  
Monitoring Equipment



## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0710 04-02

Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	Microphone
Manufacturer:	B & K	B & K
Type/Model No.:	2238	4188
Serial/Equipment No.:	2255680 / N009.01	2250447
Adaptors used:	-	-

### Item submitted by

Customer Name:  
Address of Customer:  
Request No.:  
Date of request: 10-Jul-2009

Date of test: 11-Jul-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	12-Jan-2010	CIGISMEC
Signal generator	DS 360	33873	22-Jun-2010	CEPREI
Signal generator	DS 360	61227	22-Jun-2010	CEPREI

### Ambient conditions

Temperature: (23 ± 1) °C  
Relative humidity: (55 ± 10) %  
Air pressure: (1000 ± 10) hPa

### Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

### Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

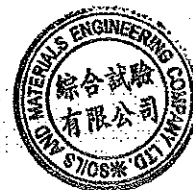
Actual Measurement data are documented on worksheets.

Approved Signatory:

Huang Jian Ming / Peng Jun Qi

Date: 14-Jul-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 09CA0710 04-02

Page 2 of 2

### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Frequency weightings	A	Pass	0.3
Time weightings	C	Pass	0.3	
	Lin	Pass	0.3	
	Single Burst Fast	Pass	0.3	
Peak response	Single Burst Slow	Pass	0.3	
	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
	Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3
Time averaging	Repeated at frequency of 100 Hz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Uncertainty (dB) / Coverage Factor	
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

### 3, Response to associated sound calibrator

N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by: C.Y. Fung  
Date: 11-Jul-2009

Checked by:   
Date: 14-Jul-2009

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.





## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0710 04-01

Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	,	Microphone
Manufacturer:	B & K	,	B & K
Type/Model No.:	2238	,	4188
Serial/Equipment No.:	2255677 / N009.02	,	2250420
Adaptors used:	-	,	-

### Item submitted by

Customer Name:  
Address of Customer:  
Request No.:  
Date of request: 10-Jul-2009

Date of test: 11-Jul-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	12-Jan-2010	CIGISMEC
Signal generator	DS 360	33873	22-Jun-2010	CEPREI
Signal generator	DS 360	61227	22-Jun-2010	CEPREI

### Ambient conditions

Temperature: (23 ± 1) °C  
Relative humidity: (55 ± 10) %  
Air pressure: (1000 ± 10) hPa

### Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

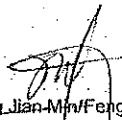
### Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

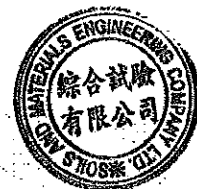
Actual Measurement data are documented on worksheets.

Approved Signatory:

  
Huang Jian-Min/Feng Jun Qi

Date: 14-Jul-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 09CA0710 04-01

Page 2 of 2

### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Linearity range for SPL	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
	Crest factor of 3	Pass	0.3	
R.M.S. accuracy	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time weighting l	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Time averaging	Single burst 10 ms at 4 kHz	Pass	0.4	
	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Uncertainty (dB) / Coverage Factor	
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

### 3, Response to associated sound calibrator

N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by: C.Y. Fung  
Date: 11-Jul-2009

Checked by:   
Date: 14-Jul-2009

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.



## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0820 04 Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	Microphone
Manufacturer:	B & K	B & K
Type/Model No.:	2238	4188
Serial/Equipment No.:	2255687 / N.009.03	2250455
Adaptors used:	-	-

### Item submitted by

Customer Name:  
Address of Customer:  
Request No.:  
Date of request: 20-Aug-2009

Date of test: 24-Aug-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	12-Jan-2010	CIGISMEC
Signal generator	DS 360	33873	22-Jun-2010	CEPREI
Signal generator	DS 360	61227	22-Jun-2010	CEPREI

### Ambient conditions

Temperature: (21 ± 1) °C  
Relative humidity: (60 ± 5) %  
Air pressure: (1005 ± 5) hPa

### Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

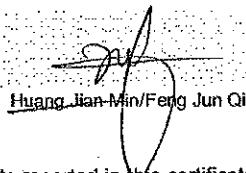
### Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

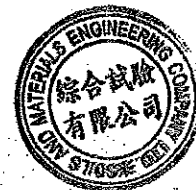
Actual Measurement data are documented on worksheets.

Approved Signatory:

  
Huang Jian-Min/Feng Jun Qi

Date: 26-Aug-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

09CA0820 04

Page 2 of 2

### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Frequency weightings	A	Pass	0.3
Time weightings	C	Pass	0.3	
	Lin	Pass	0.3	
	Single Burst Fast	Pass	0.3	
Peak response	Single Burst Slow	Pass	0.3	
	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Uncertainty (dB) / Coverage Factor	
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

### 3, Response to associated sound calibrator

N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated.

End

Calibrated by: C.Y. Fung  
Date: 24-Aug-2009

Checked by:   
Date: 26-Aug-2009

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.



## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0311 02-05 Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type I)	Microphone
Manufacturer:	B & K	B & K
Type/Model No.:	2238	4188
Serial/Equipment No.:	2285692	2565556
Adaptors used:	-	-

### Item submitted by

Customer Name:  
Address of Customer:  
Request No.:  
Date of request: 11-Mar-2009

Date of test: 14-Mar-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	12-Jan-2010	CIGISMEC
Signal generator	DS 360	33873	12-Jun-2009	CEPREI
Signal generator	DS 360	61227	18-Jul-2009	CEPREI

### Ambient conditions

Temperature: (22 ± 2) °C  
Relative humidity: (65 ± 15) %  
Air pressure: (1000 ± 10) hPa

### Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsiveness of the Sound Level Meter.

### Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:

  
Hyang Jian-Min/Feng Jun Qi

Date: 17-Mar-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 09CA0311 02-05

Page 2 of 2

### 1. Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Frequency weightings	A	Pass	0.3
Time weightings	C	Pass	0.3	
	Lin	Pass	0.3	
	Single Burst Fast	Pass	0.3	
Peak response	Single Burst Slow	Pass	0.3	
	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
	Time weighting 1	Single burst 5 ms at 2000 Hz	Pass	0.3
Time averaging	Repeated at frequency of 100 Hz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
	Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2. Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Uncertainty (dB) / Coverage Factor	
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

### 3. Response to associated sound calibrator

N/A

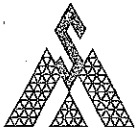
The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by: C.Y. Fung  
Date: 14-Mar-2009

Checked by:   
Date: 17-Mar-2009

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.



## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA1104 03 Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	Microphone
Manufacturer:	B & K	B & K
Type/Model No.:	2238	4188
Serial/Equipment No.:	2255688	2141430
Adaptors used:	-	-

### Item submitted by

Customer Name:  
Address of Customer:  
Request No.:  
Date of request: 04-Nov-2009

Date of test: 05-Nov-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	12-Jan-2010	CIGISMEC
Signal generator	DS 360	33873	22-Jun-2010	CEPREI
Signal generator	DS 360	61227	22-Jun-2010	CEPREI

### Ambient conditions

Temperature: (23 ± 1) °C  
Relative humidity: (60 ± 10) %  
Air pressure: (1005 ± 5) hPa

### Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure response of the Sound Level Meter.

### Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

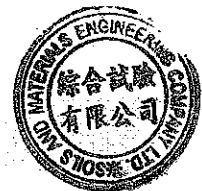
Actual Measurement data are documented on worksheets.

Approved Signatory:

Huang Jian Min/Feng Jun Qi

Date: 07-Nov-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 09CA1104 03

Page 2 of 2

### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor
Self-generated noise	A	Pass	0.3
	C	Pass	0.8 2.1
	Lin	Pass	1.6 2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3
	Reference SPL on all other ranges	Pass	0.3
	2 dB below upper limit of each range	Pass	0.3
	2 dB above lower limit of each range	Pass	0.3
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3
	Frequency weightings	A	Pass 0.3
Time weightings	C	Pass	0.3
	Lin	Pass	0.3
	Single Burst Fast	Pass	0.3
Peak response	Single Burst Slow	Pass	0.3
	Single 100µs rectangular pulse	Pass	0.3
R.M.S. accuracy	Crest factor of 3	Pass	0.3
	Time weighting I	Single burst 5 ms at 2000 Hz	Pass 0.3
Time averaging	Repeated at frequency of 100 Hz	Pass	0.3
	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4
	Sound exposure level	Single burst 10 ms at 4 kHz	Pass 0.4
Overload indication	SPL	Pass	0.3
	Leq	Pass	0.4

### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Uncertainty (dB) / Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3
	Weighting A at 8000 Hz	Pass	0.5

### 3, Response to associated sound calibrator

N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by: C.Y. Fung  
Date: 05-Nov-2009

Checked by:   
Date: 07-Nov-2009

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.



OS, NR	LOC
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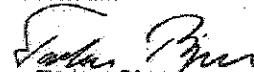
## MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær ~~-2250-L-~~ Serial No 2681366  
has been tested and passed all production tests, confirming compliance with the  
manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to National or  
International Standards or by ratio measurements.

Brüel & Kjær is certified under ISO 9001:2000 assuring that all calibration data for test  
equipment are retained on file and are available for inspection upon request.

Nærum 05-May-09

  
Torben Bjørn  
Vice President  
Operations

Please note that this document is not a calibration certificate, for information on our calibration services please  
contact your nearest Brüel & Kjær Service Center.

BA0236-13

WORLD HEADQUARTERS: DK-2850 Nærum · Denmark  
Telephone: +45 45 80 05 00 · Fax: +45 45 80 14 05 · <http://www.bksv.com> · e-mail: [info@bksv.dk](mailto:info@bksv.dk)

**Brüel & Kjær** 



## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0611 01 Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	Microphone
Manufacturer:	RION CO., LTD.	RION CO., LTD.
Type/Model No.:	NL-31	UC-53A
Serial/Equipment No.:	00320528 / N.007.03A	88783
Adaptors used:	-	-

### Item submitted by

Customer Name:  
Address of Customer:  
Request No.:  
Date of request: 10-Jun-2009

Date of test: 11-Jun-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	12-Jan-2010	CIGISMEC
Signal generator	DS 360	33873	12-Jun-2009	CEPREI
Signal generator	DS 360	61227	18-Jul-2009	CEPREI

### Ambient conditions

Temperature: 23 ± 1 °C  
Relative humidity: 55 ± 15 %  
Air pressure: 995 ± 15 hPa

### Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsiveness of the Sound Level Meter.

### Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:

Huang Jian Min / Feng Jun Qi

Date: 12-Jun-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 09CA0611 01

Page 2 of 2

### 1. Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor
Self-generated noise	A	Pass	0.3
	C	Pass	0.8 2.1
	Lin	Pass	1.5 2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3
	Reference SPL on all other ranges	Pass	0.3
	2 dB below upper limit of each range	Pass	0.3
	2 dB above lower limit of each range	Pass	0.3
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3
Frequency weightings	A	Pass	0.3
	C	Pass	0.3
	Lin	Pass	0.3
Time weightings	Single Burst Fast	Pass	0.3
	Single Burst Slow	Pass	0.3
Peak response	Single 100µs rectangular pulse	Pass	0.3
R.M.S. accuracy	Crest factor of 3	Pass	0.3
Time weighting I	Single burst 5 ms at 2000 Hz	N/A	N/A
	Repeated at frequency of 100 Hz	N/A	N/A
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4
Overload indication	SPL	Pass	0.3
	Leq	Pass	0.4

### 2. Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Uncertainty (dB) / Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3
	Weighting A at 8000 Hz	Pass	0.5

### 3. Response to associated sound calibrator

N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by: C.Y. Fung  
Date: 11-Jun-2009

Checked by:   
Date: 12-Jun-2009

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.



## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0311 02-02

Page: 1 of 2

### Item tested

Description: Acoustical Calibrator (Class 1)  
Manufacturer: B&K  
Type/Model No.: BK4231  
Serial/Equipment No.: 1850426 / N.004.02  
Adaptors used: -

### Item submitted by

Customer:  
Address of Customer: -  
Request No.: -  
Date of request: 11-Mar-2009

Date of test: 13-Mar-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2412857	29-Jun-2009	SCL
Preamplifier	B&K 2673	2239857	02-Dec-2009	CEPREI
Measuring amplifier	B&K 2610	2346941	03-Dec-2009	CEPREI
Signal generator	DS 360	61227	18-Jul-2009	CEPREI
Digital multi-meter	34401A	US36087050	03-Dec-2009	CIGISMEC
Audio analyzer	8903B	GB41300350	27-Nov-2009	CEPREI
Universal counter	53132A	MY40003662	11-Jul-2009	CEPREI

### Ambient conditions

Temperature: 23 ± 1 °C  
Relative humidity: 65 ± 10 %  
Air pressure: 1000 ± 15 hPa

### Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

### Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:

  
Hyang Jian-Min/Feng Jun Qi

Date: 17-Mar-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.





## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0311 02-01

Page: 1 of 2

### Item tested

Description: Acoustical Calibrator (Class 1)  
Manufacturer: Rion Co., Ltd.  
Type/Model No.: NC-73  
Serial/Equipment No.: 10186482 / N.004.09  
Adaptors used: -

### Item submitted by

Customer: -  
Address of Customer: -  
Request No.: -  
Date of request: 11-Mar-2009

Date of test: 13-Mar-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2412857	29-Jun-2009	SCL
Preamplifier	B&K 2673	2239857	02-Dec-2009	CEPREI
Measuring amplifier	B&K 2610	2346941	03-Dec-2009	CEPREI
Signal generator	DS 360	61227	18-Jul-2009	CEPREI
Digital multi-meter	34401A	US36087050	03-Dec-2009	CIGISMEC
Audio analyzer	8903B	GB41300350	27-Nov-2009	CEPREI
Universal counter	53132A	MY40003662	11-Jul-2009	CEPREI

### Ambient conditions

Temperature: 22 ± 1 °C  
Relative humidity: 65 ± 10 %  
Air pressure: 1000 ± 15 hPa

### Test specifications

- 1, The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- 2, The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- 3, The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

### Test results

Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:

Hoang Jian Min / Feng Jun Qi

Date: 17-Mar-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long term stability of the instrument.



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 09CA0311 02-01

Page: 2 of 2

### 1. Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Frequency Shown Hz	Output Sound Pressure Level Setting dB	(Output level in dB re 20 µPa)	
		Measured Output Sound Pressure Level dB	Estimated Uncertainty dB
1000	94.00	93.63	0.1

### 2. Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz STF = 0.004 dB

Estimated uncertainty 0.005 dB

### 3. Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz Actual Frequency = 996.0 Hz

Estimated uncertainty 0.1 Hz Coverage factor k = 2.2

### 4. Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz TND = 0.8%

Estimated uncertainty 0.7%

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by: C.Y. Fung  
Date: 13-Mar-2009

Checked by:   
Date: 17-Mar-2009

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

# **Appendix B**

## Baseline Noise Monitoring Data



**Appendix B**

**Location : M1a - Harbour Road Sports Centre**

Day time 07:00-19:00 hrs Normal Weekdays

Date	Noise Level for 30-min, dB(A)		
	Leq	L10	L90
4-Dec-09	68.9	71.0	65.5
5-Dec-09	69.2	71.4	65.3
6-Dec-09*	N/A	N/A	N/A
7-Dec-09	68.7	70.9	64.5
8-Dec-09	68.8	70.8	65.1
9-Dec-09	68.4	70.3	64.3
10-Dec-09	69.3	71.2	65.4
11-Dec-09	69.2	71.4	65.5
12-Dec-09	69.2	71.0	65.4
13-Dec-09*	N/A	N/A	N/A
14-Dec-09	69.2	71.0	66.1
15-Dec-09	69.4	71.3	65.2
16-Dec-09	69.5	71.5	65.4
17-Dec-09	70.4	72.2	67.5

Leq 30-min dB(A)	
<b>Average</b>	69.2
<b>Max</b>	70.4
<b>Min</b>	68.4

**Location : M2a - Caltex Petrol Filling Station**

Day time 07:00-19:00 hrs Normal Weekdays

Date	Noise Level for 30-min, dB(A)		
	Leq	L10	L90
4-Dec-09	72.7	74.5	70.1
5-Dec-09	73.6	75.5	70.4
6-Dec-09*	N/A	N/A	N/A
7-Dec-09	73.8	75.7	71.0
8-Dec-09	74.5	75.9	71.9
9-Dec-09	73.4	74.7	70.9
10-Dec-09	74.1	75.5	71.5
11-Dec-09	73.9	75.4	71.1
12-Dec-09	74.3	76.0	71.5
13-Dec-09*	N/A	N/A	N/A
14-Dec-09	73.0	74.7	71.0
15-Dec-09	74.5	75.7	71.7
16-Dec-09	73.2	74.7	71.0
17-Dec-09	73.8	75.0	71.2

Leq 30-min dB(A)	
<b>Average</b>	73.7
<b>Max</b>	74.5
<b>Min</b>	72.7

Remarks

\* Public holiday

**Appendix B**

**Location : M4a - Causeway Bay Community Centre**

Day time 07:00-19:00 hrs Normal Weekdays

Date	Noise Level for 30-min, dB(A)		
	Leq	L10	L90
4-Dec-09	67.2	68.8	64.5
5-Dec-09	68.8	70.3	65.7
6-Dec-09*	N/A	N/A	N/A
7-Dec-09	68.4	69.6	66.1
8-Dec-09	69.4	71.0	66.9
9-Dec-09	69.6	70.9	66.5
10-Dec-09	68.5	70.3	66.2
11-Dec-09	67.5	68.6	64.8
12-Dec-09	68.5	70.3	65.7
13-Dec-09*	N/A	N/A	N/A
14-Dec-09	69.0	71.0	66.4
15-Dec-09	68.7	70.8	66.3
16-Dec-09	68.4	70.1	66.1
17-Dec-09	69.5	71.4	67.7

Leq 30-min dB(A)	
<b>Average</b>	68.6
<b>Max</b>	69.6
<b>Min</b>	67.2

**Location : M7a - Harbour Building**

Day time 07:00-19:00 hrs Normal Weekdays

Date	Noise Level for 30-min, dB(A)		
	Leq	L10	L90
4-Dec-09	65.5	67.5	64.3
5-Dec-09	66.3	68.5	63.6
6-Dec-09*	N/A	N/A	N/A
7-Dec-09	65.5	66.8	64.4
8-Dec-09	65.0	66.3	63.5
9-Dec-09	65.2	66.7	63.8
10-Dec-09	64.7	66.0	63.6
11-Dec-09	65.5	67.3	63.5
12-Dec-09	65.8	67.7	64.2
13-Dec-09*	N/A	N/A	N/A
14-Dec-09	65.3	67.5	64.3
15-Dec-09	65.4	67.1	63.5
16-Dec-09	65.3	66.4	64.1
17-Dec-09	67.0	69.4	64.9

Leq 30-min dB(A)	
<b>Average</b>	65.5
<b>Max</b>	67.0
<b>Min</b>	64.7

Remarks

\* Public holiday

## Appendix B

### Location : M1a - Harbour Road Sports Centre

All days during evening (19:00 to 23:00 hours), and general holidays (including Sundays) during the daytime and evening (07:00 to 23:00 hours)

Date	Noise Level for 5-min, dB(A)		
	Leq	L10	L90
4-Dec-09	64.7	66.6	60.5
5-Dec-09	61.7	63.9	57.8
6-Dec-09*	66.4	68.3	62.6
7-Dec-09	59.4	62.0	56.1
8-Dec-09	58.0	59.8	55.6
9-Dec-09	57.7	59.5	54.9
10-Dec-09	58.4	59.6	56.4
11-Dec-09	58.3	61.6	53.7
12-Dec-09	61.8	62.7	59.9
13-Dec-09*	60.5	63.6	57.0
14-Dec-09	60.8	63.6	57.1
15-Dec-09	56.8	60.3	53.6
16-Dec-09	58.7	60.2	56.1
17-Dec-09	58.2	61.2	52.0

Leq 5-min dB(A)	
<b>Average</b>	60.1
<b>Max</b>	66.4
<b>Min</b>	56.8

### Location : M2a - Caltex Petrol Filling Station

All days during evening (19:00 to 23:00 hours), and general holidays (including Sundays) during the daytime and evening (07:00 to 23:00 hours)

Date	Noise Level for 5-min, dB(A)		
	Leq	L10	L90
4-Dec-09	69.1	70.1	66.6
5-Dec-09	66.2	69.3	59.4
6-Dec-09*	68.4	70.0	66.1
7-Dec-09	64.1	67.3	52.6
8-Dec-09	69.0	73.1	57.8
9-Dec-09	67.2	70.2	59.1
10-Dec-09	66.8	69.3	58.1
11-Dec-09	68.1	70.8	60.4
12-Dec-09	68.0	70.3	62.1
13-Dec-09*	69.7	70.9	67.3
14-Dec-09	65.0	68.3	53.1
15-Dec-09	68.7	72.3	56.7
16-Dec-09	68.6	71.3	60.2
17-Dec-09	68.3	70.8	59.8

Leq 5-min dB(A)	
<b>Average</b>	67.7
<b>Max</b>	69.7
<b>Min</b>	64.1

Remarks

\* Public holiday

## Appendix B

### Location : M4a - Causeway Bay Community Centre

All days during evening (19:00 to 23:00 hours), and general holidays (including Sundays) during the daytime and evening (07:00 to 23:00 hours)

Date	Noise Level for 5-min, dB(A)		
	Leq	L10	L90
4-Dec-09	65.3	67.3	62.3
5-Dec-09	62.5	65.2	56.0
6-Dec-09*	65.6	67.1	63.0
7-Dec-09	62.3	65.7	54.6
8-Dec-09	65.1	68.3	58.4
9-Dec-09	61.9	65.5	53.4
10-Dec-09	62.0	65.4	55.5
11-Dec-09	62.1	65.1	55.6
12-Dec-09	63.5	66.3	57.9
13-Dec-09*	65.5	66.9	63.0
14-Dec-09	63.0	65.9	55.5
15-Dec-09	60.9	64.5	54.1
16-Dec-09	67.2	69.9	61.9
17-Dec-09	64.8	68.1	58.3

Leq 5-min dB(A)	
<b>Average</b>	63.7
<b>Max</b>	67.2
<b>Min</b>	60.9

### Location : M7a - Harbour Building

All days during evening (19:00 to 23:00 hours), and general holidays (including Sundays) during the daytime and evening (07:00 to 23:00 hours)

Date	Noise Level for 5-min, dB(A)		
	Leq	L10	L90
4-Dec-09	61.7	63.8	58.9
5-Dec-09	57.0	58.3	55.3
6-Dec-09*	61.2	64.1	49.2
7-Dec-09	55.0	56.1	54.0
8-Dec-09	56.4	58.0	54.7
9-Dec-09	58.0	59.1	56.8
10-Dec-09	57.6	59.0	56.8
11-Dec-09	57.4	58.3	56.0
12-Dec-09	57.1	58.3	55.5
13-Dec-09*	61.3	62.2	59.8
14-Dec-09	55.8	57.0	54.5
15-Dec-09	56.1	56.8	55.3
16-Dec-09	58.1	59.2	56.6
17-Dec-09	58.1	59.0	56.7

Leq 5-min dB(A)	
<b>Average</b>	57.9
<b>Max</b>	61.7
<b>Min</b>	55.0

Remarks

\* Public holiday

**Appendix B**

**Location : M1a - Harbour Road Sports Centre**

All days during the nighttime (23:00 to 07:00 hours)

Date	Noise Level for 5-min, dB(A)		
	Leq	L10	L90
4-Dec-09	62.7	64.5	58.6
5-Dec-09	59.7	61.9	55.9
6-Dec-09*	63.0	64.7	59.3
7-Dec-09	57.5	60.1	54.3
8-Dec-09	55.6	57.3	53.3
9-Dec-09	54.7	56.4	52.1
10-Dec-09	54.7	55.9	52.9
11-Dec-09	54.1	57.2	49.9
12-Dec-09	59.2	60.1	57.4
13-Dec-09*	56.7	59.6	53.5
14-Dec-09	57.6	60.2	54.1
15-Dec-09	54.5	57.8	51.3
16-Dec-09	55.6	57.1	53.2
17-Dec-09	55.8	58.7	49.9

Leq 5-min dB(A)	
<b>Average</b>	57.2
<b>Max</b>	63.0
<b>Min</b>	54.1

**Location : M2a - Caltex Petrol Filling Station**

All days during the nighttime (23:00 to 07:00 hours)

Date	Noise Level for 5-min, dB(A)		
	Leq	L10	L90
4-Dec-09	67.6	68.6	65.1
5-Dec-09	65.5	68.5	58.8
6-Dec-09*	67.0	68.5	64.7
7-Dec-09	62.7	65.9	51.5
8-Dec-09	65.3	69.2	54.7
9-Dec-09	65.1	68.0	57.2
10-Dec-09	65.3	67.8	56.9
11-Dec-09	65.2	67.8	57.9
12-Dec-09	65.1	67.3	59.5
13-Dec-09*	66.8	67.9	64.4
14-Dec-09	62.2	65.4	50.9
15-Dec-09	65.2	68.5	53.8
16-Dec-09	65.1	67.6	57.1
17-Dec-09	65.4	67.8	57.2

Leq 5-min dB(A)	
<b>Average</b>	65.3
<b>Max</b>	67.6
<b>Min</b>	62.2

Remarks

\* Public holiday

## Appendix B

### Location : M4a - Causeway Bay Community Centre

All days during the nighttime (23:00 to 07:00 hours)

Date	Noise Level for 5-min, dB(A)		
	Leq	L10	L90
4-Dec-09	63.2	65.2	60.3
5-Dec-09	59.9	62.4	53.6
6-Dec-09*	62.9	64.2	60.3
7-Dec-09	60.4	63.7	52.9
8-Dec-09	61.7	64.7	55.3
9-Dec-09	59.3	62.7	51.2
10-Dec-09	58.8	62.0	52.6
11-Dec-09	59.5	62.3	53.2
12-Dec-09	61.5	64.2	56.0
13-Dec-09*	63.4	64.8	61.0
14-Dec-09	59.7	62.4	52.6
15-Dec-09	57.7	61.2	51.3
16-Dec-09	63.1	65.6	58.1
17-Dec-09	61.5	64.6	55.3

	Leq 5-min dB(A)
<b>Average</b>	60.9
<b>Max</b>	63.4
<b>Min</b>	57.7

### Location : M7a - Harbour Building

All days during the nighttime (23:00 to 07:00 hours)

Date	Noise Level for 5-min, dB(A)		
	Leq	L10	L90
4-Dec-09	58.5	60.5	55.9
5-Dec-09	54.1	55.2	52.4
6-Dec-09*	58.7	61.5	47.1
7-Dec-09	52.7	53.7	51.8
8-Dec-09	52.9	54.4	51.3
9-Dec-09	53.8	54.8	52.7
10-Dec-09	53.5	54.7	52.7
11-Dec-09	54.4	55.2	53.1
12-Dec-09	53.6	54.7	52.1
13-Dec-09*	56.9	57.7	55.5
14-Dec-09	52.9	54.1	51.7
15-Dec-09	52.6	53.3	51.8
16-Dec-09	53.9	54.9	52.5
17-Dec-09	58.1	59.0	56.7

	Leq 5-min dB(A)
<b>Average</b>	54.8
<b>Max</b>	58.7
<b>Min</b>	52.6

Remarks

\* Public holiday

# **Appendix C**

## Responses to Comments

**Response to Comment - EPD's letter ref.: (25) in EP2/H4/S3/15 Pt.3 dated 25 January 2010**

Comments	Reponses
<b>Initial Comments:</b>	
<b>General:</b>	
(1) The baseline report was submitted to meet the requirements of the capitoned 2 permits. Since the scopes of the two permits are different and the EM&A requirements shall follow the 2 standardalone EM&A Manuals to be approved under each of the 2 permits, two standalone baseline montioring reports shall be submitted to meet the requirements of the 2 permits separately.	As the works under the two separate permits are actually carried out together under a number of works contracts divided geographically, and the EM&A works for all these works contracts (with DPs) are conducted by a single ET and verified by a single IEC, we suggest the updated EM&A Manuals for these two permits are combined into a single volume which is applicable to both EPs, with those EM&A items applicable to only one particular EP properly annotated. This will give a more complete overall picture of the EM&A for the whole Project.
<b>Specific:</b>	
<b>Background</b>	
(2) S1.1: The project locations and scopes of the 2 permits are different. The project site of EP-364/2009 includes Central harbourfront area (but not mentioned in s.1.1.1). The term "study area" should be replaced by "proeject area" in the baseline reports where appropriate. S1.1.4 copying from the WDII&CWB EIA report should be amended to suit the corresponding baseline reports.	Noted and the wordings will be revised.
<b>Proposed alternative monitoring location</b>	
<b>Sections 2.3 of Baseline Report:</b>	
(3) It is noted that some alternative noise monitoring locations are proposed when compared with the EIA reports. According to S2.3.2, Appendix D2, 'Guidelines for Development project in Hong Kong – Environmental Monitoring and Audit,' <i>When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:</i> (a) <i>at locations close to the major site activities which are likely to have noise impacts;</i> (b) <i>close to the noise sensitive receivers (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre shall be considered as a noise</i>	The noise monitoring stations at roof-top of Mayson Garden (M3) and Harbour Building (MA1b) are the only accessible buildings for installing the equipment to carry out the consecutive 14-day baseline noise monitoring. None of the nearby low-rise locations are allowed for such monitoring. Therefore, these two locations are considered to be the best alternative locations.



<p><i>sensitive receiver); and</i></p> <p><i>(c) For monitoring locations located in the vicinity of the sensitive receivers, care shall be taken to cause minimal disturbance to the occupants during monitoring.”</i></p> <p>Please provide your considerations and justifications for the proposed changes in monitoring locations in the baseline reports.</p> <p>The noise monitoring stations at the roof-top of high-raised buildings e.g. at Station M3 (Mayson Garden, 24/F) and M7a (Harbour Building, 27/F) are not representative/acceptable if the noise sources are mainly at ground/low levels. Alternative representative noise monitoring locations should be selected.</p>	
<p><u>Section 2.6, Executive Summary and Appendix B of Baseline Report:</u></p>	
<p>(4) For the noise results taken during the time period other than 0700 – 1900 hours on normal weekdays, please break-down and report the results during different time periods (i) all days during evening (19:00 to 23:00 hours), and general holidays (including Sundays) during the daytime and evening (07:00 to 23:00 hours); and (ii) all days during the nighttime (23:00 to 07:00 hours) since the noise standards would be different in these periods. Hence, also please present the measurement time periods of all of the results in Appendix B for easy reference.</p>	<p>Noted and will be amended.</p>
<p><u>Figures</u></p>	
<p>(5) Figures/location plans should be provided in each baseline reports to show the project elements and works under the corresponding permits. For example, Figure 2.1 did not show some of the project area under EP-364/2009 at the western end near Shun Tak Centre. Besides, some of the project elements (e.g. water mains and sewage outfall under EP-356/2009 were also missing. Please amend.</p>	<p>Noted and will be provided.</p>