2011

CS ACOUSTICS

Noise at work risk assessment

This report documents noise levels taken during an assessment of the Liquidroom Operatives noise exposure. It was carried out on 16th February 2011 at the Liquidroom premises.

It includes recommendations of actions to be carried out to ensure that the Liquidroom Staff comply with the requirements of "The Control of noise at work regulations 2005" which became applicable in April 2006.

Craig Shaw
CS ACOUSTICS
18th Feb, 2011

Assessment of noise exposure of Liquidroom staff working in areas outlined in Appendix 4, 9c Victoria Street, Edinburgh.

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Date	16th February 2011

SUMMARY

This report documents noise levels taken during an assessment of the Liquidroom Operatives noise exposure. It was carried out on 16th February 2011 at the Liquidroom premises. It includes recommendations of actions to be carried out to ensure that the Liquidroom Staff comply with the requirements of "The Control of noise at work regulations 2005 " which became applicable in April 2006.

Contents

1. Objectives

To carry out an assessment of Liquidroom staff noise exposure in accordance with "The Control of Noise at Work Regulations 2005" (ref 1), which came into force April 2006.

2. Conclusions

Liquidroom staff working in the following areas will be exposed to noise levels above the Lower Action Value (LAV) of 80dB (A). They will also be exposed to noise levels above the Upper Action Value (UAV) of 85dB (A).
The exposure times are shown in table 1.

1. **Balcony Area**
   Staff working in the Balcony Area will be exposed to a daily $L_{EP,d}$ at or Above the Upper Daily Action Value (UAV)* of 101.2dB(A):

2. **Dancefloor Area**
   Staff working in the Dancefloor Area will be exposed to a daily $L_{EP,d}$ at or Above the Upper Daily Action Value (UAV)* of 108.6dB(A):

3. **FOH Position**
   Sound Engineers working in the FOH Position will be exposed to a daily $L_{EP,d}$ at or Above the Upper Daily Action Value (UAV)* of 102.1dB(A):

4. **Monitors / Foldback Position**
   Sound Engineers working in the Monitors Position will be exposed to a daily $L_{EP,d}$ at or Above the Upper Daily Action Value (UAV)* of 100.5dB(A):

5. **Top Bar**
   Bar staff working in the top bar will be exposed to a daily $L_{EP,d}$ at or Above the Upper Daily Action Value (UAV)* of 101.2dB(A):

6. **Bottom Bar**
   Bar staff working in the bottom bar will be exposed to a daily $L_{EP,d}$ at or Above the Upper Daily Action Value (UAV)* of 104.5dB(A):

7. **Cloakroom**
   Staff working in the cloakroom will be exposed to a daily $L_{EP,d}$ at or Above the Upper Daily Action Value (UAV)* of 101.7dB(A):

8. **Side of Stage Left**
   Staff working by the stage will be exposed to a daily $L_{EP,d}$ at or Above the Upper Daily Action Value (UAV)* of 102.6dB(A):

9. **Side of Stage Right**
   Staff working by the stage will be exposed to a daily $L_{EP,d}$ at or Above the Upper Daily Action Value (UAV)* of 102.7dB(A):

10. **Back Fire Exit (Finnegans)**
    Security Staff working in the back fire exit will be exposed to a daily $L_{EP,d}$ at or Above the Lower Daily Action Value (LAV)* of 83.1dB(A):

11. Main Entrance

Security Staff working in the main entrance will be exposed to a daily $L_{EP,d}$ at or Above the Lower Daily Action Value (LAV)* of 82.4dB(A):

12. Balcony Office

Staff working in the balcony office will be exposed to a daily $L_{EP,d}$ at or Above the Lower Daily Action Value (LAV)* of 84.4dB(A):

13. Manager's Office

Staff working in the main entrance will be exposed to a daily $L_{EP,d}$ at or Above the Lower Daily Action Value (LAV)* of 83.2dB(A):

14. Ticket Office

Staff working in the main entrance booth will be exposed to a daily $L_{EP,d}$ at or Above the Lower Daily Action Value (LAV)* of 84.0dB(A):

15. Cellar

Staff working in the cellar will be exposed to a daily $L_{EP,d}$ at or Above the Higher Daily Action Value (HAV)* of 89.2dB(A):

The "peak" sound pressure levels did not exceed the LAV of 135dB(C) in any area.

* See Appendix 1 for Glossary of Terms

3. Recommendations

3.1 In order to comply with The Control of Noise at Work regulations 2005 it is recommended that the following actions are taken.

Regulation 5 - Assessment of the risk to health and safety created by exposure to noise in the workplace:

This report records the measurements taken as part of this noise assessment. The assessment should be reviewed and updated under the following conditions

a. Changes in the work place such as alterations to the building,
b. Changes in people such as new staff or changes to shift roster,
c. New plant or machinery,
d. After a period of two years has passed with no other changes.

It should be noted that as plant ages its noise level may rise.

It is recommended that assessments are kept for a period of 40 years. If the company ceases to trade then the reports must be passed to the enforcing authority.

Regulation 6 - Elimination or control of exposure to noise in the workplace:

The Liquidroom should ensure that the risk from exposure to noise for their employees is either eliminated at source or where this is not reasonable practicable, then it is reduced to as low a level as is reasonably practicable.

Due to the nature of the business it is not possible to reduce any further the noise levels sound engineers and staff will be exposed to. A limiter is employed on sound production equipment to prevent levels in excess of L_{CPEAK} 115dB(A).

Regulation 7 – Hearing Protection

Personal hearing protection should only be used as a last resort when all possible noise reduction measures have been achieved under regulation 6.
For employees who are likely to be exposed to $L_{EP,d}$ at or above the Lower Action Value (LAV) of 80dB(A) but below the Higher Action Value (HAV) 85dB(A) suitable hearing protection must be made available , however the wearing of such protection is optional but advisable.

For areas where the employees $L_{EP,d}$ has been identified as exceeding the UAV of 85dB(A) then the wearing of suitable Hearing protection is compulsory.
These areas shall also be marked as *Hearing Protection Zones* and marked as with appropriate signage. The signs used shall comply with the Health & Safety (Safety Signs and Signals) Regulations 1996.

The regulations also have an Exposure Limit value (ELV) of 87 dB (A) this value to be calculated taking into account personal hearing protection worn by operatives. Guidance issued by the HSE states that under real use hearing protectors will give lower protection than predicted by the manufacturer. This can be caused by the wearing of spectacles, incorrect selection of protection or poor fitting of protection.
To take these factors into account the HSE recommend that the protector is de-rated by 4dB.

Taking this into account together with the noise levels and exposure time as shown in table 1, the hearing protection provided will provide adequate attenuation and keep their noise exposure below the ELV of 87dB(A).

Regulation 8 – Maintenance and use of equipment

The Liquidroom shall ensure that all equipment under their control on site (e.g. exhaust silencers, shrouds and acoustic enclosures) are in accordance with these Regulations, fully maintained and kept in good repair in accordance with manufacturer's instructions.

Employees shall use as instructed any and all hearing protection as issued by the company, they shall keep it clean and in good condition and stored in a clean dry location. Also all defects are to be immediately reported to the site Supervisor so that the protection can be replaced.

Regulation 9 - Health Surveillance

The Liquidroom should provide health surveillance to sound engineers regularly exposed to noise levels above the UAV of 85 dB (A). For general staff exposed to noise levels between the LAV and UAV, or for occasional exposure above the UAV, health surveillance will only be required if information comes to light that the engineer may be particularly sensitive to noise-induced hearing loss (NIHL).

Regulation 10 – Information , Instruction and Training

The Liquidroom will provide to each of their employees who are liable to be exposed to a $L_{EP,d}$ equal to or above the LAV Instruction, information and training of the following subjects:

(a) The nature of risks from exposure to noise,
(b) The organisational and technical measures taken in order to comply with the requirements of Regulation 6,
(c) The exposure limit values and upper and lower exposure levels set out in Regulation 4,
(d) The significant findings of the risk assessment, including any measures taken with an explanation of those findings,
(e) The availability and provision of personal hearing protection under Regulation 7 and the correct use in accordance with Regulation 8(2),
(f) Why and how to detect and report signs of hearing damage,
(g) The entitlement to health surveillance under Regulation 9 and its purposes,
(h) Safe working practices to minimise exposure to noise,
(i) The collective results of any health surveillance undertaken in accordance with regulation 9, in a form designed to prevent those results being identified as relating to a particular person.

Note! The actions required under the Control of Noise at Work Regulations 2005 are summarised in appendix 3.

1. Noise Assessment

An assessment of the noise exposure for The Liquidroom staff within the various areas' was carried out using a Bruel & Kjaer 2250 sound meter. Confirmation of calibration was conducted using a Bruel & Kjaer 4231 sound calibrator both before and after testing.

Measurements were taken of "A" weighted sound pressure levels (L_{Aeq}) at the operative's ear position while they carried out their duties in each area.
The daily personal exposure level ($L_{EP,d}$) was then calculated from the measured noise (L_{Aeq}) and the amount of time an operative was likely to be exposed to said noise. In addition the "Peak" sound Pressure (L_{Cpeak}) was measured.

It was decided to carry out a single assessment to cover all Liquidroom staff working at the venue. Below is a discovery table outlining all readings carried out in the venue and their locations as shown in the diagrams in appendix 4.

Location	Noise Level		Test Time
	$L_{C\ peak}$	Lea_q	
1. Balcony Area	107.1	101.2	10 min
2. Dancefloor	109.6	108.6	10 min
3. FOH Position	108.3	102.1	10 min
4. Monitor Position	104.1	100.5	10 min
5. Top Bar	104.9	101.4	25 min
6. Bottom Bar	107.2	104.5	25 min
7. Cloakroom	105.0	101.7	10 min
8. Side of stage left	104.8	102.6	10 min
9. Side of stage right	105.2	102.7	10 min
10. Finnegans' Exit	84.7	83.1	10 min
11. Front Entrance	84.9	82.4	10 min
12. Main Office	85.3	84.4	10 min
13. Manager's Office	84.6	83.2	10 min
14. Ticket Booth	85.8	84.0	10 min
15. Cellar	92.6	89.2	10 min

With the exception of the dancefloor area, all readings were carried out during a typical event at the venue. The measurements were taken near the end of the event where possible to provide realistic peak levels. Readings for the dancefloor were taken before the event and reflect a typical maximum level the sound engineers allow during the event. The staff have been divided into 3 groups based on their ability to rotate to different areas and the levels they are exposed to. Those groups are analysed as per the table descriptions below.

Table 1 shows the measured L_{Aeq} noise levels and the calculated $L_{EP,d}$ Values for bar staff as they rotate through their duty cycle. They work 4 – 6 hours per day for a total of four shifts per week.

Table 2 shows the measured L_{Aeq} noise levels and the calculated $L_{EP,d}$ Values for production staff during a typical shift. They work 6 – 9 hours per day for a total of five shifts per week.

Table 3 shows the measured L_{Aeq} noise levels and the calculated $L_{EP,d}$ Values for Security staff as they rotate through their duty cycle. They work 4 – 6 hours per day for a total of four shifts per week.

Discussion

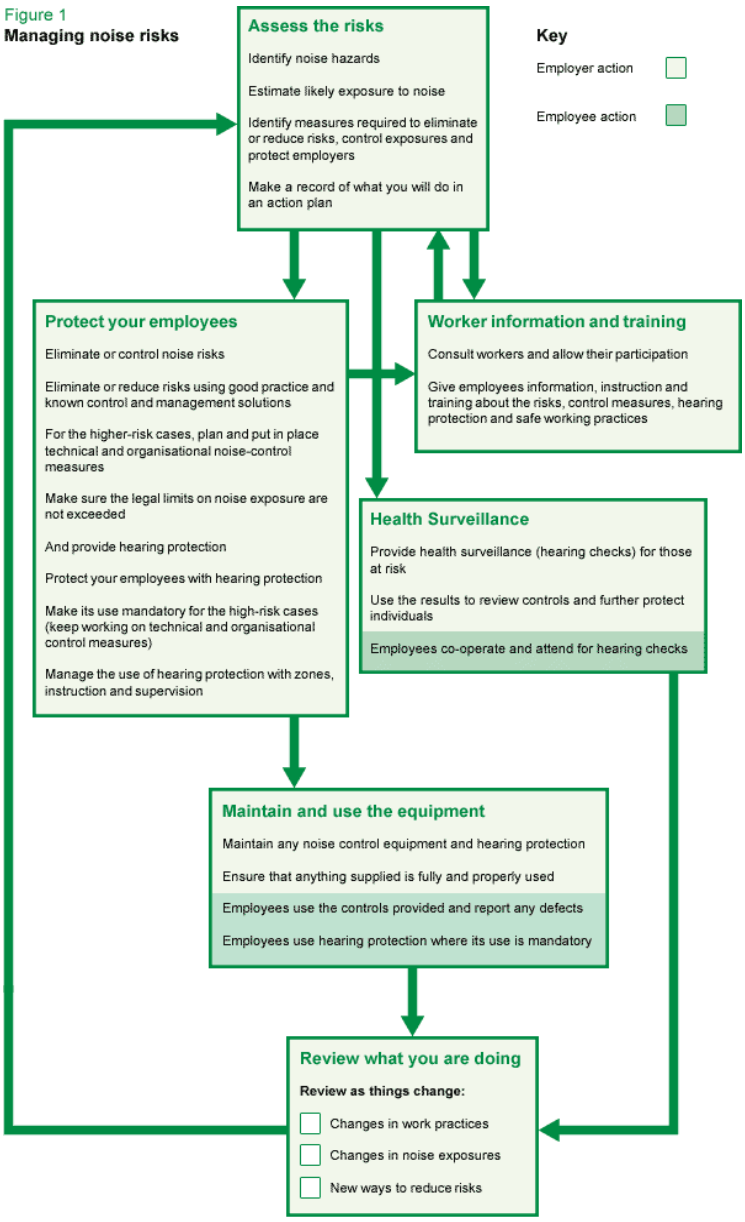
Bar staff are rotated to quieter areas after a 45 minute period but over 50% of their shift is with levels higher than the Upper action Value of 80dB(A) as shown in table 1. Staff are given a 15 minute break every 1 ½ hours and are encouraged to leave red areas during this time.

Foam ear-plugs are supplied by the management The will be typically utilised during performance duration with a SNR 30dB(C) reduction giving calculated level at the ear of 79dB(C).
according to BS EN ISO 4869-2:1995 (∞=1)

Production staff operating sound & lighting equipment cannot be rotated to quiet areas during live performances but do have over 50% of their shift with levels less than the Lower action Value of 80dB(A) as shown in table 2.

Flat response ear-plugs are typically utilised during performance duration with a SNR 20dB(C) reduction giving calculated level at the ear of 87dB(C).
Etymotic Research ER-20 High-fidelity Earplugs are supplied by the management for staff without custom plugs. SNR 20dB(C) equal reduction is achieved over 5 octaves giving calculated level at the ear of 87dB(C).
according to BS EN ISO 4869-2:1995 (∞=1)

Figure 1
Managing noise risks



Security staff are most likely to experience the highest continuous exposure period during the dancefloor rotation with peak levels of 109dB(C) expected. The staff are rotated to quieter areas after a 30 minute period but do have over 50% of their shift with levels higher than the Lower action Value of 80dB(A) as shown in table 3. Staff are given a 15 minute break every 1 ½ hours and are encouraged to leave red areas during this time.

Foam ear-plugs are supplied by the management The will be typically utilised during performance duration with a SNR 30dB(C) reduction giving calculated level at the ear of 79dB(C).
according to BS EN ISO 4869-2:1995 (∞=1)

All staff are informed of the sound levels they are likely to experience in each area of their duty cycle. Management provide appropriate hearing protection adequate for the noise levels encountered reducing noise levels by 20-30dB(C). The management recommend that protection is utilised in all red areas

Colour coding for $L_{EP,d}$ Values in Table 1

The $L_{EP,d}$ values in Table 1 have been highlighted to reflect the different exposure limit values and action levels of "The Control of Noise at Work Regulations 2005" for employee's noise exposure. The table below gives an explanation of the colours used.

A Daily ($L_{EP,d}$) or Weekly ($L_{EP,w}$) below the Lower Action Value (LAV) of 80dB(A) and a Peak sound pressure (L_{CPeak}) below 135 dB(C).	
A Daily ($L_{EP,d}$) or Weekly ($L_{EP,w}$) above the Lower Action Value (LAV) of 80dB(A) and a Peak sound pressure (L_{CPeak}) at or above 135 dB(C).	
A Daily ($L_{EP,d}$) or Weekly ($L_{EP,w}$) at or above the Upper Action Value (LAV) of 85dB(A) and a Peak sound pressure (L_{CPeak}) above 135 dB(C).	

Record of Noise assessments

Site: Liquidroom Venue, 9c Victoria Street, Edinburgh.

Operative Assessed: Bar Staff Date of Assessment: 16th Feb, 2011.

Table 1

Location	Noise Level $L_{C\ peak}$	Noise Level Lea_q	Test Time	Daily Exposure	LEP,d dB(A)	No's Exposed	Condition comments
1. Balcony Area	107.1	101.2	10 min	30 min	89	1	*see (1) below*
2. Dancefloor	109.6	108.6	10 min	30 min	97	2	*see (1) below*
5. Top Bar	104.9	101.4	25 min	225 min	98	3	*see (1) below*
6. Bottom Bar	107.2	104.5	25 min	225 min	101	3	*see (1) below*
7. Cloakroom	105.0	101.7	10 min	300 min	98	1	*see (1) below*
11. Front Entrance	84.9	82.4	10 min	60 min	70	2	*see (3) below*
14. Ticket Booth	85.8	84.0	10 min	180 min	80	1	*see (1) below*
15. Cellar	92.6	89.2	10 min	20 min	77	1	*see (5) below*

Exposure over shift duty rotation

	Noise Level (L_{Aeq} dB)	Exposure duration (hours)	Exposure points (job/task)	Exposure points per hour
Balcony	101	0.25	124	498
Dancefloor	109	0.25	785	3140
Top Bar	102	1.75	1096	626
Bottom Bar	105	1.75	1950	1114
Cloakroom	102	0.5	313	626
Main Entrance	83	0.5	4	8
Ticket Booth	75	1	1	1
	Total duration	6		
Daily noise exposure ($L_{EP,d}$)		**101 dB**	**4273 points**	

This gives a total LEP,d of 101 dB(A) for an six hour Shift.
This is above the upper action value and it is recommended that Hearing protection be worn while working in these areas designated red.

Comments:

1. *Bar staff are rotated between the bars, cloakroom, dancefloor & balcony (collecting glasses) and external promotional duties. They will typically work a maximum of 45 minutes in any one area.*
2. *Production staff are unable to rotate to other areas or duties. They will typically work an average of 55 minutes in their assigned position.*
3. *Security staff are rotated between the sides of stage, dancefloor & balcony areas, rear exit to smoking area and front door. They will typically work a maximum of 25 minutes in any red area.*
4. *Administration and Management staff are typically in office areas for continuous periods of 60 minutes.*
5. *Cellar is only accessed for an average of 30 min per night.*

Site: Liquidroom Venue, 9c Victoria Street, Edinburgh.

Operative Assessed: Production Staff Date of Assessment: 16th Feb, 2011.

Table 2

Location	Noise Level $L_{C\ peak}$	Noise Level Lea_q	Test Time	Daily Exposure	LEP,d dB(A)	No's Exposed	Condition comments
3. FOH Position	108.3	102.1	10 min	100 min	95	2	*see (2) below*
4. Monitor Position	104.1	100.5	10 min	100 min	94	1	*see (2) below*
8. Side of stage left	104.8	102.6	10 min	60 min	94	1	*see (3) below*
9. Side of stage right	105.2	102.7	10 min	60 min	94	1	*see (3) below*
11. Front Entrance	84.9	82.4	10 min	60 min	73	2	*see (3) below*

Exposure over shift duration

	Noise Level (L_{Aeq} dB)	Exposure duration (hours)	Exposure points (job/task)	Exposure points per hour
FOH Position	102	1.75	1096	626
Monitor Position	101	1.75	871	498
Side of stage Left	103	0.25	197	789
Side of stage Right	103	0.25	197	789
Main Entrance	83	0.5	4	8
Rig & Strike ambient	75	3	4	1
Soundcheck	103	1.5	1183	789
Total duration		9		
Daily noise exposure ($L_{EP,d}$)		**101 dB**	**3552 points**	

This gives a total LEP,d of 101 dB(A) for an nine hour Shift.
This is above the upper action value and it is recommended that Hearing protection be worn while working in these areas designated red.

Comments:

6. *Bar staff are rotated between the bars, cloakroom, dancefloor & balcony (collecting glasses) and external promotional duties. They will typically work a maximum of 45 minutes in any one area.*
7. *Production staff are unable to rotate to other areas or duties. They will typically work an average of 55 minutes in their assigned position.*
8. *Security staff are rotated between the sides of stage, dancefloor & balcony areas, rear exit to smoking area and front door. They will typically work a maximum of 25 minutes in any red area.*
9. *Administration and Management staff are typically in office areas for continuous periods of 60 minutes.*
10. *Cellar is only accessed for an average of 30 min per night.*

Site: Liquidroom Venue, 9c Victoria Street, Edinburgh.

Operative Assessed: Security Staff Date of Assessment: 16th Feb, 2011.

Table 3

Location	Noise Level $L_{C\ peak}$	Noise Level Lea_q	Test Time	Daily Exposure	LEP,d dB(A)	No's Exposed	Condition comments
1. Balcony Area	107.1	101.2	10 min	30 min	89	1	*see (1) below*
2. Dancefloor	109.6	108.6	10 min	30 min	97	2	*see (1) below*
8. Side of stage left	104.8	102.6	10 min	30 min	94	1	*see (3) below*
9. Side of stage right	105.2	102.7	10 min	30 min	94	1	*see (3) below*
10. Finnegans' Exit	84.7	83.1	10 min	90 min	74	1	*see (3) below*
11. Front Entrance	84.9	82.4	10 min	90 min	70	2	*see (3) below*

Exposure over shift duty rotation

	Noise Level (L_{Aeq} dB)	Exposure duration (hours)	Exposure points (job/task)	Exposure points per hour
Balcony	103	0.5	394	789
Dancefloor	109	0.5	1570	3140
Top Bar	103	0.5	394	789
Bottom Bar	103	0.5	394	789
Cloakroom	83	1	8	8
Main Entrance	83	1	8	8
	Total duration	5		
Daily noise exposure ($L_{EP,d}$)		**99 dB**	**2768 points**	

This gives a total LEP,d of 99dB(A) for an five hour Shift.
This is above the upper action value and it is recommended that Hearing protection be worn while working in these areas designated red.

Comments:

11. *Bar staff are rotated between the bars, cloakroom, dancefloor & balcony (collecting glasses) and external promotional duties. They will typically work a maximum of 45 minutes in any one area.*
12. *Production staff are unable to rotate to other areas or duties. They will typically work an average of 55 minutes in their assigned position.*
13. *Security staff are rotated between the sides of stage, dancefloor & balcony areas, rear exit to smoking area and front door. They will typically work a maximum of 25 minutes in any red area.*
14. *Administration and Management staff are typically in office areas for continuous periods of 60 minutes.*
15. *Cellar is only accessed for an average of 30 min per night.*

Appendix 1: Glossary of Terms

Sound	That which is detected by the ear.
Noise	Any audible sound.
Sound Pressure	The variation of ambient pressure that is detected by the ear as sound.
Decibel (dB)	Ten times the logarithm of the square of the ratio of the sound pressure to a reference pressure (20 micro Pascals).
Sound Pressure Level (L_P)	The Decibel version of Sound-Pressure.
A Weighting	A frequency weighting that simulates the response of the ear. Sound Pressure Levels with the 'A' weighting have a unit of dB(A).
L_{eq}	The Value of the Sound Pressure Level in dB, of a continuous sound which has the same mean square sound pressure as a sound which varies with time, i.e., the average sound pressure level.
$L_{EP,d}$	The " daily personal noise exposure level". This is the level of daily personal noise exposure of an employee, taking no account of the effect of any personal hearing protector used.
$L_{EP,w}$	The " weekly personal noise exposure level". This is the level of weekly personal noise exposure of an employee, taking no account of the effect of any personal hearing protector used.
L_{Cpeak}	The peak sound pressure level in dB(C)
Lower Action Value	A $L_{EP,d}$ or $L_{EP,w}$ personal exposure of 80dB(A) and L_{Cpeak} of 135 dB(C).
Upper Action Value	A $L_{EP,d}$ or $L_{EP,w}$ personal exposure of 85dB(A) and L_{Cpeak} of 137 dB(C).
Exposure Limit Value	A $L_{EP,d}$ or $L_{EP,w}$ personal exposure of 87dB(A) and L_{Cpeak} of 140 dB(C).

Appendix 2: Noise instrumentation Certification

Calibration was checked both before and after measurement sessions and was at 94 +/- 0.1 dB.

Scan and insert the Equipment calibration certificates after here samples left as examples

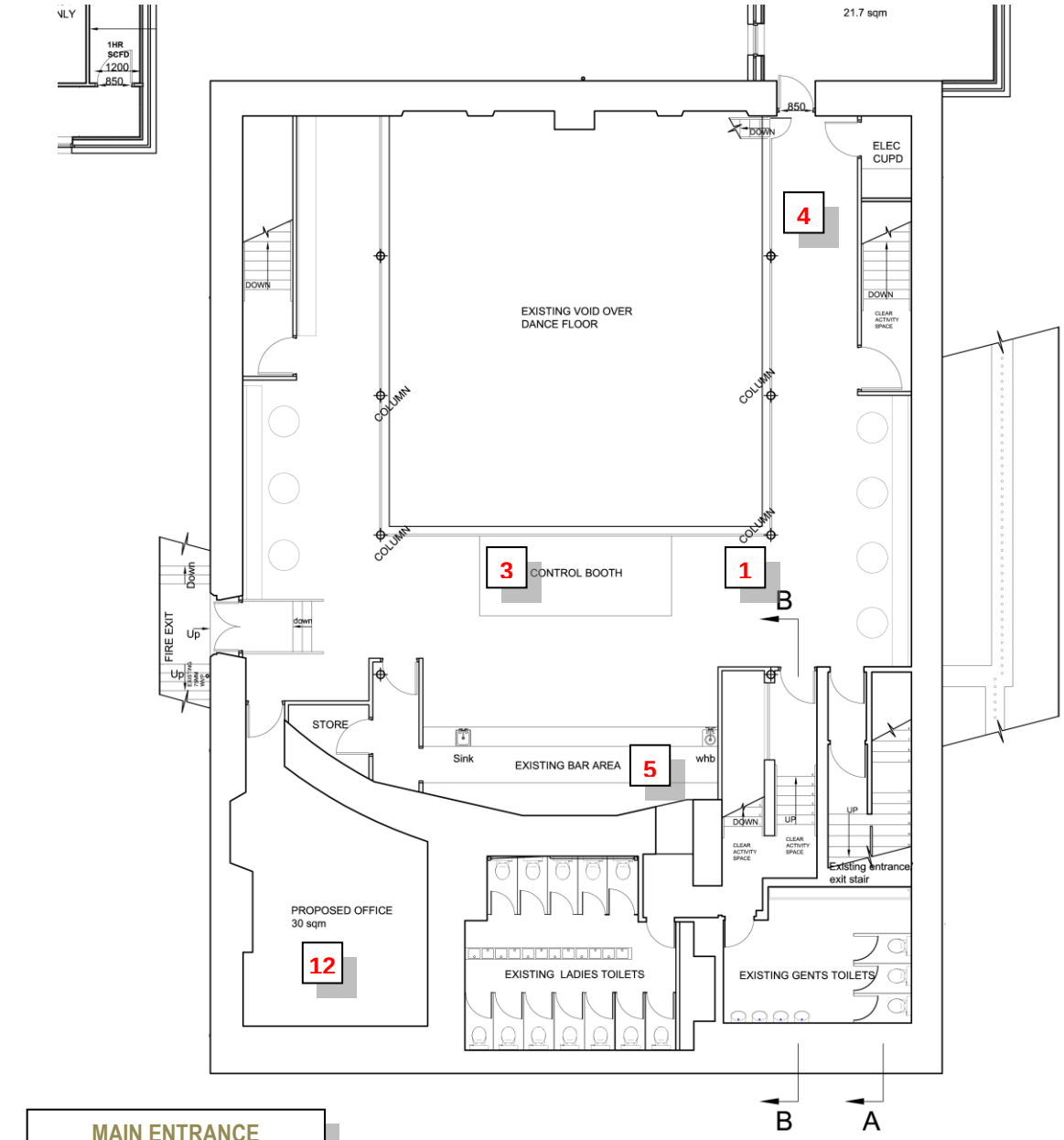
Appendix 3:

Action Required Where LEP.d is likely to be	Below 80 dB(A)	Above 80 dB(A) LAV (2)	Above 85 dB(A) UAV (3)	Above 87 dB(A) ELV (4)
Regulation 5 - Assessment of the risk to health & safety created by exposure to noise in the Workplace				
Undertake an assessment by a competent person of the risk from noise to the health & safety of employees	*	*	*	*
Assess the levels of noise to which workers are exposed, review the risk when the assessment is no longer valid and keep a record of the assessment .		*	*	*
Regulation 6 - Elimination or Control of exposure to Noise in the workplace				
Risk from exposure to noise is either eliminated at source or, reduced to the lowest level as is practicable.	*	*	*	*
Reduce exposure to as low as is reasonably practicable by establishing and implementing a programme or organisational and technical measures excluding hearing protectors.			*	
Ensure Employees are not exposed above ELV (taking into account hearing protection); or if not exceeded, reduce to below ELV, Identify reasons for exceeding again.				*
Regulation 6 - Hearing Protection				
Make Hearing Protection available on request to an employee who is so exposed		*		
Provide hearing protection available to any employee who is exposed and designate area as a Hearing Protection Zone			*	*
Regulation 8 - Maintenance and use of Equipment				
Ensure so far as is practicable that all equipment under the Regulations is used (other than hearing protection provided) and ensure that all equipment is maintained and in good repair		*	*	*
Regulation 9 - Health Surveillance				
Ensure Employees identified as being at risk from noise are placed under suitable health surveillance (including testing of hearing), and keep a suitable record of Employee health surveillance .	*	*	*	*
employees to co-operate with any health surveillance programme implemented by the employer	*	*	*	*
Regulation 10 - Information , Instruction and training				
Provide adequate information, Instruction and training to employees about the likely noise exposure and the risk to hearing. What is being done to control Risks and exposure . How they can obtain hearing protection, how to report defects, Employees duties, What health surveillance will be provided, what symptoms of hearing loss to look for and how to report them	*	*	*	*

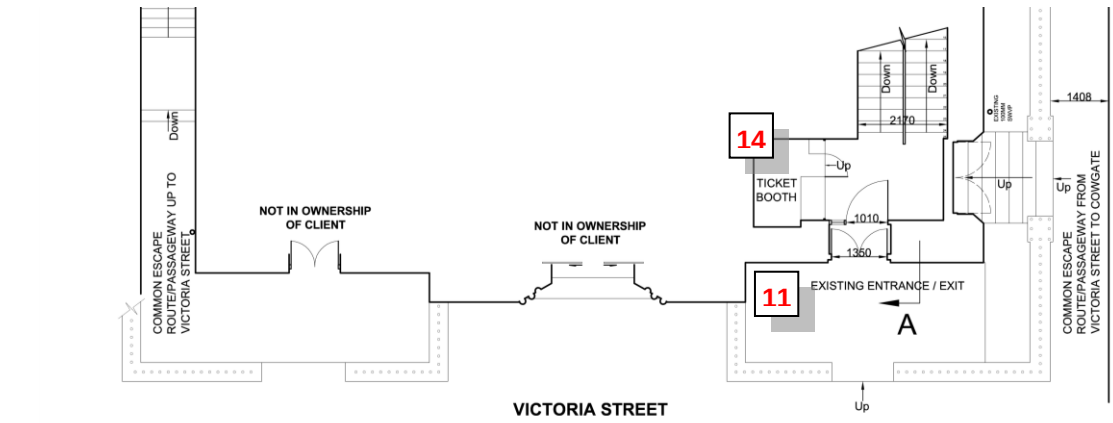
Summary of actions required by The Control of Noise at Work Regulations 2005

Appendix 4: Locations of readings

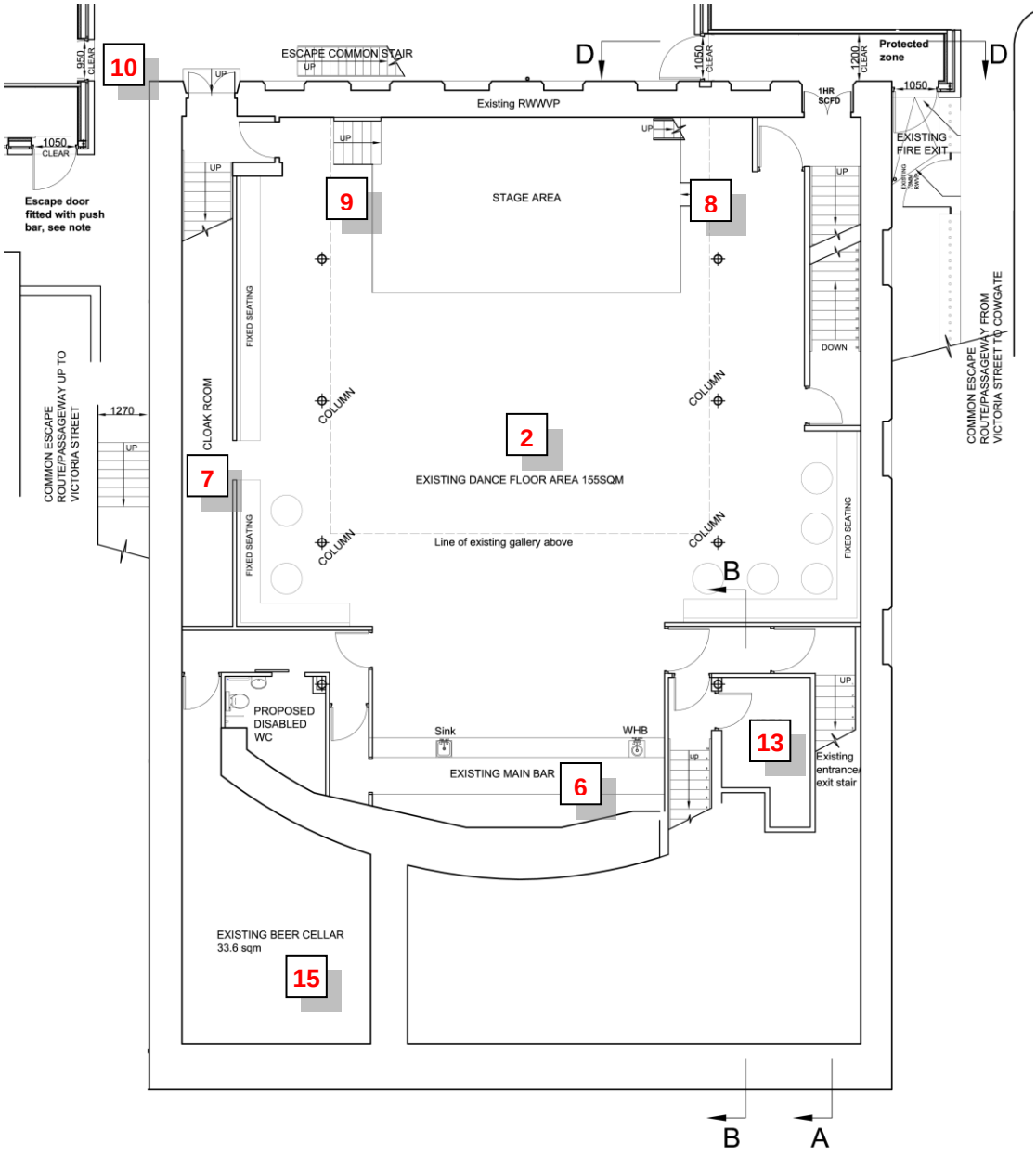
BALCONY LEVEL



MAIN ENTRANCE



DANCEFLOOR LEVEL



REFERENCES

1. Health and Safety Executive Guidance on regulations
   Controlling Noise at work
   The control of Noise at work regulations 2006
   HMSO ISBN 0- 7176-6164-4