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REPORT

Merkur Slots
11-13 Market Place
Newbury
Noise Assessment

Client: Cashino Gaming Ltd

Reference: PR2001_28_FINAL

Date: 01/10/2020

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1 Introduction

1.1 Background

Archo Consulting Ltd have been appointed to undertake an assessment of sound insulation performance for a new Merkur Slots site at 11-13 Market Place, Newbury. Planning permission is being sought for 24-hour operation and as such the assessment has been undertaken in accordance with night-time internal noise criteria thresholds in accordance with BS8233:2014.

An onsite inspection has been undertaken of the existing condition of the separating ceiling and walls to identify areas where the sound insulation performance can be improved. Recommendations for improvement have been made in order to prevent noise impacts to adjacent noise sensitive receptors. The resulting sound insulation performance has been calculated using INSUL Sound Insulation Prediction Software to prove compliance.

Recommendations to mitigate potential noise flanking paths during construction have been made as well as suggestions for internal finishes to absorb operational sound.

1.2 Site Context

The site is at ground floor level facing out onto Market Place street with commercial units on each side. The site has residential apartment units directly above which are considered to be the closest noise sensitive receptors. Predictions of the sound insulation performance after implementation of recommendations and defect rectification are provided to ensure noise impacts do not occur. Measurements of operational noise levels from an existing Merkur Cashino site have been used to assess noise breakout.

2 Guidance and Acoustic Requirements

2.1 Legislation

Noise impacts to adjacent residential premises have been calculated and assessed in accordance with the following standards:

- *British Standard (BS) 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings* (herein after referred to as BS 8233:2014).

Full details of all legislation, guidance and standards referenced for noise assessments are presented in **Appendix A**.

3 Onsite Inspection and Assessment

3.1 Background

In order to assess the current site conditions, an inspection and assessment was undertaken on the 30th September 2020. The assessment focused predominantly on the ceiling area, walls and shop front which will separate the premises from the adjacent spaces. Detailed site notes and accompanying photographs were taken to inform the assessment and are presented in **Section 3.2** below.

3.2 Onsite Observations

It was noted onsite that a suspended grid ceiling was present which incorporated mineral fibre ceiling tiles and the above ceiling area consisted solid concrete, the thickness of which could not be measured. Concrete slabs in residential premises are required to have a minimum thickness of 4 inches (101mm) and therefore, to provide a worst-case scenario assessment this assumption was used although in reality the slab is likely thicker.

The separating walls were noted to be composed of breeze block covered with a layer of plasterboard. The entrance consisted of a single-leaf glass door and glazed front.

Table 1 below presents the key findings of the onsite investigation in relation to the sound insulation performance including photos for reference:

Table 1: Site Assessment Findings and Recommendations

Site Photo	Comment
	Location: *Entrance Doors* It is recommended that acoustic perimeter seals are installed around the frame of the door and at the junction between the double leaf doors to prevent unnecessary sound transmission to the outside. It is recommended that the doors also incorporate an automatic closer system
	Location: *Separating floor* The separating concrete slab floor was in good condition with no M&E penetrations causing sound flanking. It is recommended that if any new M&E services penetrations are added the void is fully sealed up with mortar. Alternatively for smaller penetrations rockwool insulation can be inserted and the hole covered with plasterboard.

Table 1: Site Assessment Findings and Recommendations

Site Photo	Comment
	Location: *Ceiling* It is recommended that the mineral fibre ceiling is retained and a layer of insulation (e.g. rockwool or equivalent) is used above the ceiling to assist in dampening the sound.

4 Predicted Sound Insulation Performance and Assessment

4.1 British Standard 8233:2014

Guidance on suitable internal noise levels is provided in BS 8233:2014 (Section 7.7.2, Table 4) derived from the guidance provided by the WHO. This details recommended internal noise levels to ensure that adequate noise reduction occurs to reduce direct and flanking transmission across facade elements. Recommended internal noise levels are reproduced in **Table 2** below:

Table 2: Recommended Internal Noise Levels – BS 8233:2014

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedrooms	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

It is understood that the site will be operational 24-hours a day. It can be observed from **Table 2** above that the night-time (23:00 to 07:00) internal noise criteria is more stringent. Therefore, **the threshold of 30 dB $L_{Aeq,8hour}$** presented in **Table 2** above representing the BS8233:2014 night-time criteria has been referenced for this assessment.

4.2 Operational Noise Levels in Existing Merkur Cashino

Previous measurements of internal noise levels within an operational Merkur Cashino in Hull are presented in **Table 3** below. These measurements were made in 2 locations inside the Cashino on 17th March 2020 during a particularly busy period when the bingo machines were in operation and noise levels were at the highest. Measurements were made for 5 minutes in each location which were at opposite ends of the Cashino to gain representative operational levels. A description of acoustic terminology is provided in **Appendix B**.

Table 3: Source Level Noise Measurements within Operational Merkur Cashino

Measurement	L_{Aeq}	L_{Amax}	Octave Band Levels (dB)						
			125	250	500	1kHz	2kHz	4kHz	8kHz
MP1	65.7	73.6	65.8	66.1	62.8	61.5	56.1	52.0	49.3
MP2	63.1	75.0	59.9	63.6	61.1	58.3	53.9	46.5	41.0

Table 4 below presents the details of the equipment used at the time of the measurements (17/03/2020):

Table 4: Instrumentation

Instrument	Serial No.	Calibration Due Date at Time of Survey
Norsonic 140 Class 1 Sound Level Meter	1406433	August 2021
Norsonic 1209 Preamplifier	21318	August 2021
Norsonic 1225 Microphone	226973	August 2021
Nor 1252 Acoustic Calibrator	31717	April 2020

4.3 Site Context in Relation to Noise

During the site visit in which source noise levels were measured, the following contextual factors were noted with relation to noise:

- No sound was audible outside of the premises to the front or rear during peak operation;
- Internal noise levels were not high with normal conversations clearly audible and perceptible at normal speech level;
- Max levels were infrequent and short in duration;
- Patrons observed entering and leaving the premises during peak operation were always alone or in a pair with no loud conversation or rowdy behaviour observed; and,
- Patrons enter and leave quickly without loitering.

4.4 Sound Insulation Prediction

Since the closest noise sensitive receptors to the site are the flats situated directly above, the ceiling area is the main focus of the sound insulation assessment. In order to provide a prudent assessment, potential noise breakout through the glazing element of the shopfront has been undertaken.

With reference to the site observations detailed in **Section 3** and the proposed construction of the site, INSUL Sound Insulation Prediction Software was used to calculate the sound reduction to be achieved by the ceiling once all defects detailed in **Table 1** have been rectified. It was noted on site that the ceiling tiles are plastic and not the normal acoustic mineral fibre type. It is recommended that these are changed to mineral fibre to improve the acoustic performance. The following details were used to calculate the predicted performance which represent a conservative approach:

Ceiling:

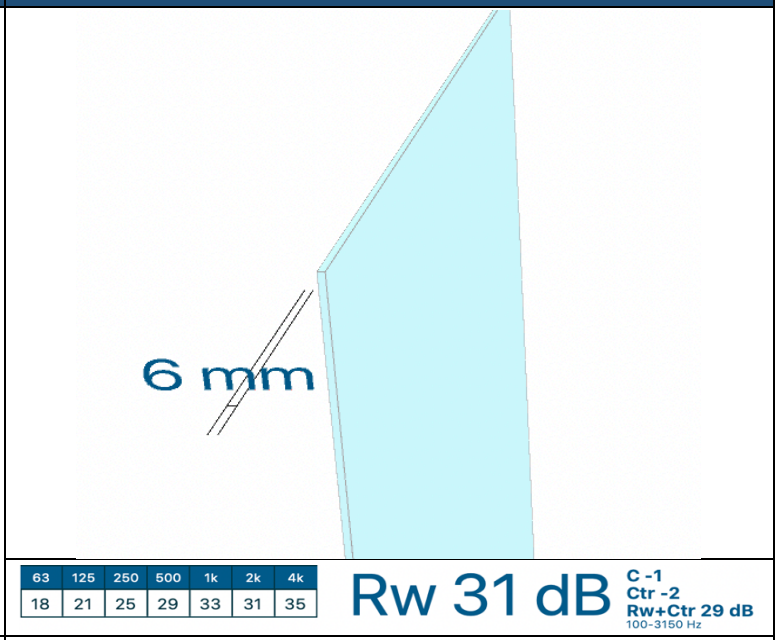
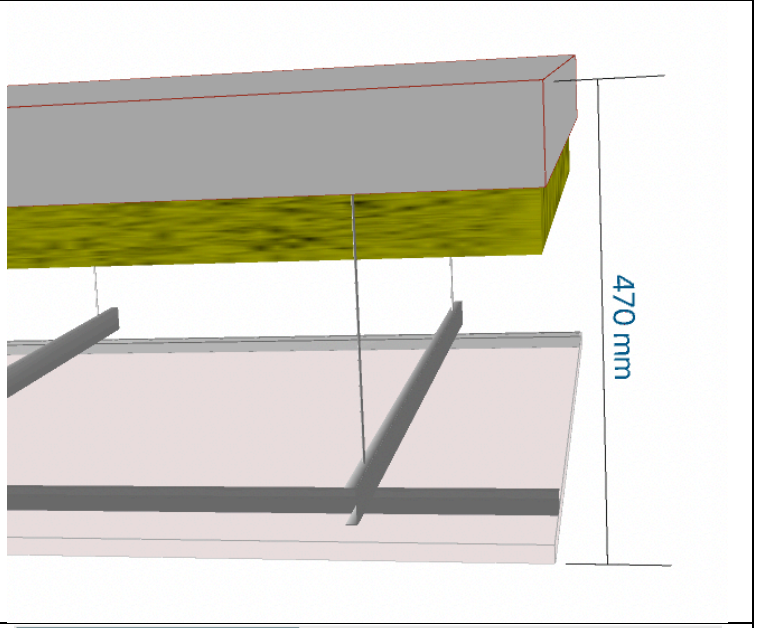
- 101mm thick cast concrete slab;
- 2 x layer of 15mm thick plasterboard;
- 100mm thick rockwool insulation (or equivalent); and,
- Suspended grid mineral fibre ceiling (19mm thick) replacing existing plastic tiles.

Shopfront:

- 6mm thick glazing.

Using these configurations described above, INSUL Sound Insulation Prediction Software was used to calculated the performance once all defects have been rectified presented in **Table 5** below:

Table 5: Predicted Sound Insulation Performance

Element	Illustration
Shopfront	 63 125 250 500 1k 2k 4k 18 21 25 29 33 31 35 Rw 31 dB C -1 Ctr -2 Rw+Ctr 29 dB 100-3150 Hz
Ceiling	 63 125 250 500 1k 2k 4k 37 54 57 58 67 75 82 Rw 65 dB C -1 Ctr -4 Rw+Ctr 61 dB 100-3150 Hz

4.5 Assessment of Noise Breakout

With reference to **Table 3,** the measured operational noise levels within a Merkur Cashino during peak times ranged between L_{Aeq} 63.1 dB to 65.7 dB with L_{Amax} levels peaking at 75.0 dB. **Table 6** below details the predicted noise levels at the closest noise sensitive receptor (measured to be approximately 3 metres from entrance). This site location and layout is presented in **Appendix C**.

Table 6: Predicted Noise Levels

Source Noise Level	Element	Calculated Sound Reduction from Element	Resulting Noise Level in First Floor Apartment / Adjacent Unit	BS8233:2014 Criteria	Comment
L_{Aeq} 65.7 dB	Shopfront	31.0 dB	+10.2 dB*	30.0 dB	Compliant with BS8233:2014
L_{Amax} 75.0 dB			+19.5 dB*		Compliant with BS8233:2014
L_{Aeq} 65.7 dB	Ceiling	65.0 dB	+0.7 dB	30.0 dB	Compliant with BS8233:2014
L_{Amax} 75.0 dB			+10.0 dB		Compliant with BS8233:2014

** Note: calculated over a 3-metre distance and applying -15dB to account for a partially open window in accordance with BS8233:2014.*

It can be observed from **Table 6** above that, once all rectification work has been completed, the predicted noise levels at the closest noise sensitive receptors are significantly below BS8233:2014 criteria for internal habitable rooms during the night-time. It should be noted that this assessment represents a worst-case scenario and in practise noise levels will likely be lower.

It is recommended that consideration be given to inclusion of soft internal finishing such as fabric panelling to further reduce internal noise levels.

5 Conclusion

A site inspection and assessment of sound insulation performance has been undertaken for the new Merkur Slots site located at 11-13 Market Place, Newbury. The site will be operational 24-hours a day.

The inspection has identified the current configuration and areas in which the sound insulation performance can be improved. All defects, site photos and recommendations for rectification are presented in **Table 1** of this report.

Based on the configuration of the separating elements and the identified areas of improvement, the sound insulation performance was calculated using INSUL Sound Insulation Prediction Software and presented in **Table 5**.

An assessment of noise breakout was undertaken using source noise measurements previously obtained from a Merkur site in Hull during peak operation and is presented in **Table 6**. The assessment showed that the separating elements will attenuate noise levels sufficiently to comply with the criteria stipulated within BS8233:2014 for internal habitable rooms. This is conditional upon rectification of all defects identified in **Table 1**. Once all defects identified in **Table 1** have been rectified the site will be suitable for 24-hour operation.

Appendix A – Legislation

Legislative Framework and Planning Policy

National Legislation

Environmental Protection Act 1990

Section 79 of the Act defines statutory nuisance with regard to noise and determines that local planning authorities have a duty to detect such nuisances in their area.

The Act also defines the concept of "Best Practicable Means" (BPM):

> *" 'practicable' means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;*
> *the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;*
> *the test is to apply only so far as compatible with any duty imposed by law; and*
> *the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances."*

Section 80 of the Act provides local planning authorities with powers to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence.

The Control of Pollution Act 1974

Section 60 of the Act provides powers to Local Authority Officers to serve an abatement notice in respect of noise nuisance from construction works.

Section 61 provides a method by which a contractor can apply for 'prior consent' for construction activities before commencement of works. The 'prior consent' is agreed between the Local Authority and the contractor and may contain a range of agreed working conditions, noise limits and control measures designed to minimise or prevent the occurrence of noise nuisance from construction activities. Application for a 'prior consent' is a commonly used control measure in respect of potential noise impacts from major construction works.

National Policy Guidance

National Planning Policy Framework 2019

The National Planning Policy Framework (NPPF) was introduced in March 2012 replacing the former Planning Policy Guidance 24: Planning and Noise. It was revised in July 2018 and in February 2019 and this document now forms the basis of the Government's planning policies for England and how these should be applied.

Paragraph 170 of the National Planning Policy Framework (NPPF) states that planning policies and decisions should contribute to and enhance the natural and local environment by:

> *".....preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution...."*

Furthermore, Paragraph 180 of the NPPF states:

> *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health,*

living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) *Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life:*

b) *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and,*

c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

The NPPF also refers to the Noise Policy Statement for England (NPSE) (Defra, 2010).

Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) document was published by Defra in 2010 and paragraph 1.7 states three policy aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
avoid significant adverse impacts on health and quality of life;
mitigate and minimise adverse impacts on health and quality of life; and,
where possible, contribute to the improvement of health and quality of life."

The first two points require that significant adverse impact should not occur and that, where a noise level falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect:

"…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur." (Paragraph 2.24, NPSE, March 2010).

Section 2.20 of the NPSE introduces key phrases including "Significant adverse" and "adverse" and two established concepts from toxicology that are being applied to noise impacts:

"NOEL – No Observed Effect Level
This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
LOAEL – Lowest Observed Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected".

Paragraph 2.21 of the NPSE extends the concepts described above and leads to a significant observed adverse effect level – SOAEL, which is defined as the level above which significant effects on health and quality of life occur.

The NPSE states:

"*it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations*". (Paragraph 2.22, NPSE, March 2010).

Furthermore paragraph 2.22 of the NPSE acknowledges that:

> "*further research is required to increase understanding of what may constitute a significant adverse effect on health and quality of life from noise*".

National Planning Practice Guidance for Noise

The National Planning Practice Guidance for Noise (NPPG Noise, December 2014), issued under the NPPF, states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Guidance

The following guidance has been used for the purpose of the noise and vibration assessment:

British Standard (BS) 7445: Parts 1 and 2 - Description and measurement of environmental noise

This Standard provides details of the instrumentation and measurement techniques to be used when assessing environmental noise, and defines the basic noise quantity as the continuous A-weighted sound pressure level (LAeq). Part 2 of BS 7445 replicates ISO standard 1996-2.

BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

Provides a methodology to calculate the noise levels entering a building through facades and façade elements and provides details of appropriate measures for sound insulation between dwellings. It includes recommended internal noise levels which are provided for a variety of situations.

World Health Organisation (WHO) (1999) Guidelines for community noise

These guidelines present health-based noise limits intended to protect the population from exposure to excess noise. They present guideline limit values at which the likelihood of particular effects, such as sleep disturbance or annoyance, may increase. The guideline values are 50 or 55dB LAeq during the day, related to annoyance, and 45 dB LAeq or 60dB LAmax at night, related to sleep disturbance.

British Standard (BS) 4142:2014 – Method for rating and assessing industrial and commercial sound

BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

Appendix B – Description of Acoustic Terms

Term	Description
Noise sensitive receptors	People, property or designated sites for nature conservation that may be at risk from exposure to noise and vibration that could potentially arise as a result of the proposed development/project
Noise and Vibration study area	The area assessed for noise and vibration impacts during this assessment
Baseline scenario	Scenarios with the proposed development/project not in operation
Decibel (dB)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.
dB(A)	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
LAeq,T	The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). LAeq,T is used to describe many types of noise and can be measured directly with an integrating sound level meter.
LA10,T	The A weighted noise level exceeded for 10% of the specified measurement period (T). LA10 is the index generally adopted to assess traffic noise
LA90, T	The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014 it is used to define the 'background' noise level.
LAmax	The maximum A-weighted sound pressure level recorded during a measurement.

Rw	Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies.
Sound Reduction Index (SRI)	Laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

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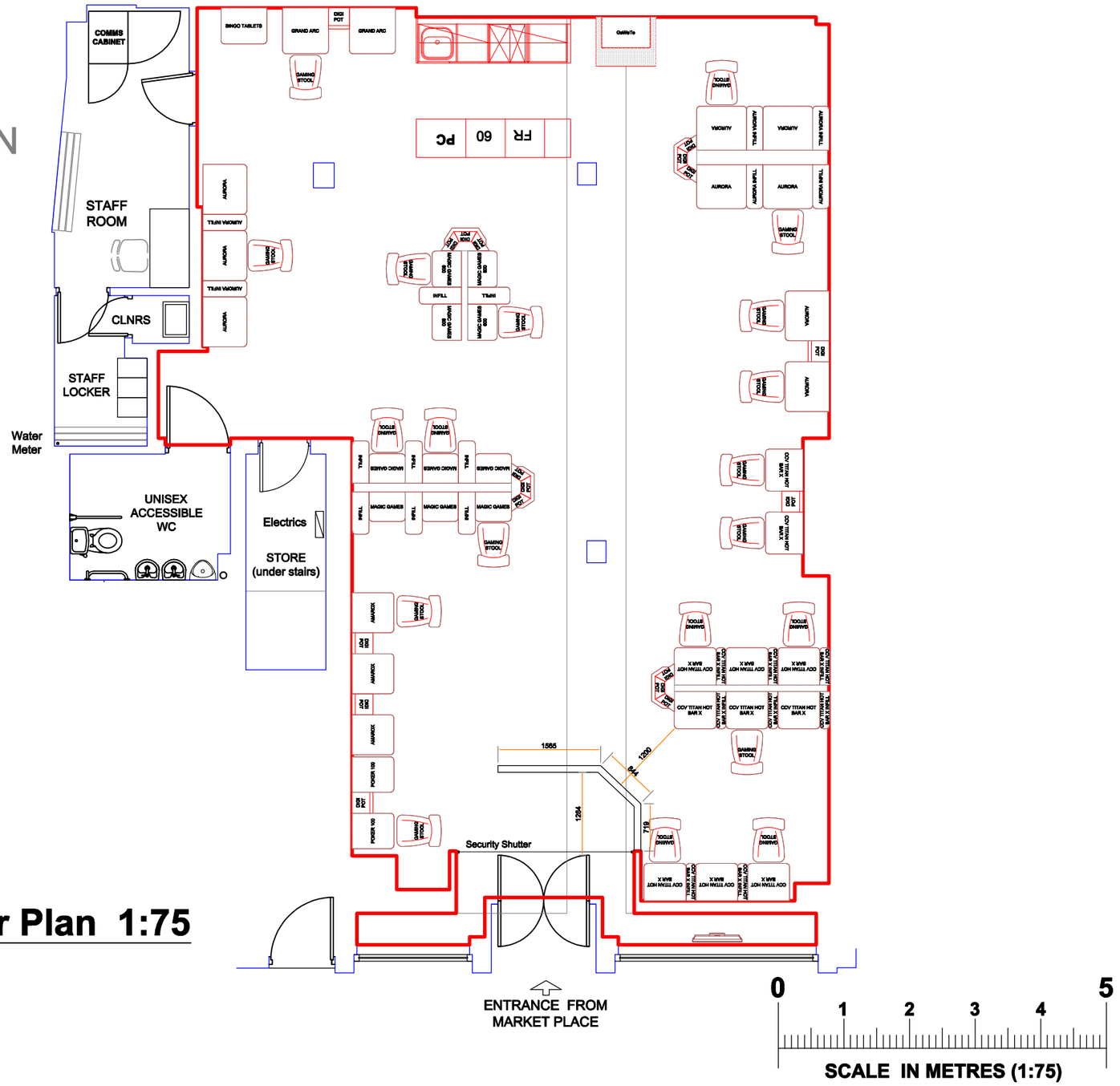
Appendix C – Proposed Plan

CUSTOMER AREA	
115.0m2	1237.9ft2

FOR ILLUSTRATION PURPOSES ONLY



Proposed Ground Floor Plan 1:75

REVISIONS	FIT OUT TYPE Merkur Slots PROJECT Merkur Slots 11 - 13 MARKET PLACE NEWBURY RG14 5AA DESCRIPTION PROPOSED MACHINE PLAN	REFERENCE DRAWINGS SCALE 1:75 DRAWN BY DATE 27/09/2020 DRAWING No. / REVISION	MERKUR SLOTS