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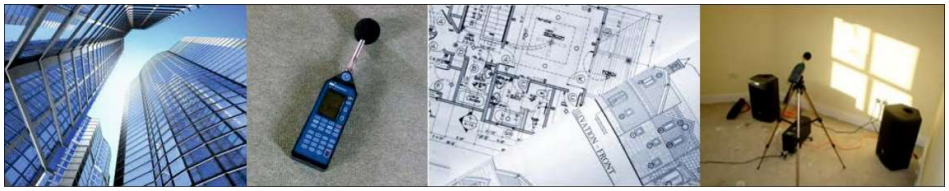

REPLACEMENT CHILLERS
GILLIAN LYNNE THEATRE
166 DRURY LANE
LONDON
WC2B 5PW

NOISE IMPACT ASSESSMENT

Client:
LW THEATRES LIMITED
Drury House
34 – 43 Russell Street
London
WC2B 5HA

11 January 2024
Ref: M5503

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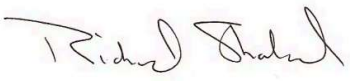
Signature	
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1. SUMMARY

1.1 This report has been prepared on behalf LW Theatres Limited, to consider the acoustic impact of replacement chillers on the roof of the Gillian Lynne Theatre, Drury Lane, London.

1.2 Two existing chillers, which have operated since 2016, are to be replaced, in the same location, with new efficient units.

1.3 A noise survey has been undertaken close to the nearest noise sensitive neighbours, and this has confirmed a relatively steady noise climate, governed by other items of building service plant locally.

1.4 In accordance with the London Borough of Camden's current noise policy, it is recommended that noise from the new units will be designed to the following limits, in order to ensure the situation is judged to be below the No Observed Effect Level:

Period	**Day Time Periods 0700 – 2300**		**Night Time Periods 2300 – 0700**	
Noise Type	**General**	**Tonal / Intermittent**	**General**	**Tonal / Intermittent**
Location:				
Properties Overlooking Cavendish Mews	**39**	**34**	**38**	**33**

Table 1.1 – Design Limits (LAeq, t) for New Chillers, dB(A)

1.5 The two Aermec NRG1100 chillers will be installed, with a proprietary attenuation package, within a louvred compound on the uppermost roof of the building. It is noted that the existing louvred compound will be slightly adjusted in size (both footprint and height) to accommodate the larger units.

1.6 Predictions of the noise emitted suggests a level of 36 dB(A) at the façade of the nearest noise sensitive properties. The noise will not be perceptible tonal in character.

1.7 In absolute terms, therefore, the installation will comply with the Local Authority's current noise policy.

1.8 Furthermore, in comparison with the two units being replaced, the rated noise level of the two new units is 1.5 dB louder - a barely perceptible change. However, it is noted that any increase in level at noise sensitive neighbours will be less than this amount, due to the greater significance of other noise sources locally. Therefore, in relative terms, the proposed replacement is deemed to have no adverse effect.

2. INTRODUCTION

2.1 Ian Sharland Limited has been instructed to assess the potential acoustic impact relating to the installation of a replacement chiller on the roof of the Gillian Lynne Theatre, Drury Lane, London.

2.2 The theatre is located on a site bordered by Drury Lane, Parker Street and Macklin Street (see Figure 1).

2.3 The surrounding area is a mixture of commercial and residential premises. Of particular interest to the exercise here are the residential properties at 20 Parker Mews, and 18 – 24 Parker Street.

2.4 The theatre is serviced by numerous items of building services plant. The primary chillers are located at high level on the north-east side of the building (see Figure 1). The existing equipment requires replacement, and the purpose of this exercise is to confirm that the new chillers will cause no material increase in existing noise levels, and will otherwise satisfy the requirements of the Local Authority.

2.5 This report will discuss the legislative background, relevant to the installation of building services plant, the results of an ambient noise survey conducted at the site, and the recommendations for the design of the new plant.

3. REVIEW OF RELEVANT GUIDANCE

3.1 National Planning Policy Framework (December 2023)

3.1.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

3.1.2 Planning law requires that applications for planning permission be determined in accordance with the development plan, unless material considerations indicate otherwise. The National Planning Policy Framework must be considered in preparing the development plan and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.

3.1.3 The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

3.1.4 Paragraphs 180, 191 & 193 of the NPPF states:

180. *Planning policies and decisions should contribute to and enhance the natural and local environment by:*

(a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

(b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;

(c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;

(d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;

(e) 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 or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

(f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

191. *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 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[1] ;
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.

***193.** Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*

3.2 National Policy Statement for England (March 2010)

3.2.1 The document "Noise Policy Statement for England" sets out the following vision for on-going noise policy:

"Promote good health and quality of life through the effective management of noise within the context of Government policy on sustainable development."

3.2.2 This vision should be achieved through the following Noise 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".*

3.2.3 To achieve these objectives the Noise Policy Statement sets out three noise levels to be defined by the assessor:

- **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.

[1] Refers here to the NPSE, discussed in Section 3.2 of this report.

- **LOAEL** - Lowest Observed Adverse Effect Level
  This is the level above which adverse effects on health and quality of life can be detected. Where levels lie between the LOAEL and SOAEL, the Statement requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, as set out in the NPPF.
- **SOAEL** - Significant Observed Adverse Effect Level
  This is the level above which significant adverse effects on health and quality of life occur. It notes, however, that "it is not possible to have a single objective noise-based measure that describes SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".

3.2.4 Paragraph 2.7 states that "… the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a policy, development or other activity may not have been given adequate weight when assessing the noise implications".

3.2.5 This provides clear guidance that noise must not be considered in isolation but as part of the overall scheme, taking into account the overall sustainability and associated impacts of the proposed development; there is no benefit in reducing noise to an excessively low level if this creates or increases some other adverse impact. Similarly, it may be appropriate in some cases for noise to have an adverse impact if this is outweighed by the reduction or removal of some other adverse impact that is of greater significance to the development.

3.2.6 The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL noise levels, the Policy Statement requires that:

> *"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development.... This does not mean that such adverse effects cannot occur."*

3.2.7 Where noise levels are below the LOAEL it is considered there will be no adverse effect. Once noise levels are below the NOEL there will be no observable change. An indication of the numerical definition of LOAEL may be derived from the following guidance.

3.3 Planning Practice Guide 'Noise' (July 2019)

3.3.1 The Ministry of Housing Communities and Local Government provided further guidance to support the NPPF. The section, Noise, published in July 2019, provides the following advice:

When is noise relevant to planning?

Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

What are the observed effect levels?

- *Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur.*
- *Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected.*
- *No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.*

Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.

How can it be established whether noise is likely to be a concern?

At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed effect' level. However, the noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the 'lowest observed adverse effect' level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the 'significant observed adverse effect' level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring,

for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided.

3.3.2 The table below summarises the noise exposure hierarchy, based on the likely average response:

Perception	***Examples of Outcomes***	***Increasing Effect Level***	***Action***
No Observed Effect Level			
Not Present	*No Effect*	*No Observed Effect*	*No specific measures required*
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	*No Observed Adverse Effect*	*No specific measures required*
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	*Observed Adverse Effect*	*Mitigate and reduce to a minimum*
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area	*Significant Observed Adverse Effect*	*Avoid*
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	*Unacceptable Adverse Effect*	*Prevent*

Table 3.1 – Noise Exposure Hierarchy

3.3.3 The guidance further advises:

What factors influence whether noise could be a concern?

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation.

These factors include:

- the source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night.
- for a new noise making source, how the noise from it relates to the existing sound environment.
- for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise.
- the spectral content of the noise (i.e. whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features), and
- the local arrangement of buildings, surfaces and green infrastructure, and the extent to which it reflects or absorbs noise.

More specific factors to consider when relevant include:

- the cumulative impacts of more than one source of noise.
- whether any adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time (and the effect this may have on living conditions). In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations;
- In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur.
- Noise Action Plans (where these exist), and, in particular the Important Areas identified through the process associated with the Environmental Noise Directive and corresponding regulations should be taken into account. Defra's website has information on Noise Action Plans and Important Areas. Local authority environmental health departments will also be able to provide information about Important Areas.
- the effect of noise on wildlife. Noise can adversely affect wildlife and ecosystems. Particular consideration needs to be given to the potential effects of noisy development on international, national and locally designated sites of importance for biodiversity.

- where external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.
- some commercial developments including restaurants, hot food takeaways, night clubs and public houses can have particular impacts, not least because activities are often at their peak in the evening and late at night. Local planning authorities will wish to bear in mind not only the noise that is generated within the premises but also the noise that may be made by customers in the vicinity.

When proposed developments could include activities that would be covered by the licensing regime, local planning authorities will need to consider whether the potential for adverse noise impacts will be addressed through licensing controls (including licence conditions). Local planning authorities should not however presume that licence conditions will provide for noise management in all instances and should liaise with the licensing authority.

Are there further considerations relating to mitigating the impact of noise on residential developments?

Noise impacts may be partially offset if residents have access to one or more of:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling.
- a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects.
- a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or
- a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5-minute walking distance).

3.4 The London Plan, Spatial Development Strategy for Greater London

3.4.1 The London Plan, Spatial Development Strategy for Greater London (March 2021) provides guidance on the Mayor's strategy to reduce noise.

3.4.2 Policy D13 Agent of Change states:

C New noise and other nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts for neighbouring residents and businesses.

D Development proposals should manage noise and other potential nuisances by:

1) ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area

2) exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations

3) separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures.

E Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed.

3.4.3 Policy D14 Noise states:

A In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

1) avoiding significant adverse noise impacts on health and quality of life

2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change

3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses

4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)

5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation

6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles

7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

B Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations.

3.4.2 The Plan advises:

3.14.1 The management of noise is about encouraging the right acoustic environment, both internal and external, in the right place at the right time. This is important to promote good health and a good quality of life within the wider context of achieving sustainable development. The management of noise should be an integral part of development proposals and considered as early as possible. Managing noise includes improving and enhancing the acoustic environment and promoting appropriate soundscapes. This can mean allowing some places or certain times to become noisier within reason, whilst others become quieter. Consideration of existing noise sensitivity within an area is important to minimise potential conflicts of uses or activities, for example in relation to internationally important nature conservation sites which contain noise sensitive wildlife species, or parks and green spaces affected by traffic noise and pollution. Boroughs, developers, businesses and other stakeholders should work collaboratively to identify the existing noise climate and other noise issues to ensure effective management and mitigation measures are achieved in new development proposals.

3.5 London Borough of Camden Local Plan (2017)

3.5.1 The Camden Local Plan sets out the Council's planning policies and replaces the Core Strategy and Development Policies planning documents (adopted in 2010). Its aim is to ensure that Camden continues to have robust, effective and up-to-date planning policies that respond to changing circumstances and the borough's unique characteristics and contribute to delivering the Camden Plan and other local priorities.

3.5.2 Policy A4, Noise and Vibration, includes the following clauses:

The Council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:

a. development likely to generate unacceptable noise and vibration impacts; or
b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.

3.4.5 The Noise Strategy (2010 – 2015) document sets out the overarching framework, and the Noise Technical Guidance Note offers noise thresholds for different development types.

3.6 Camden Planning Guidance 'Amenity' (July 2021)

3.6.1 The supplementary planning document provides guidance for developers on how they can meet the Local Authority's environmental policies The document thereby aims to help applicants understand how to make successful planning applications.

3.6.2 In Section 6, Nosie and Vibration, the document indicates .

The Council will assess the impact of noise and vibration through the consideration of acoustic reports submitted by applicants.
Noise mitigation (where appropriate) is expected to be incorporated into developments at the design stage.
The Council will secure mitigation measures through planning condition or legal agreement where necessary.
The Council will adopt the 'agent of change' principle.

3.6.3 In respect of projects involving new plant and other noise generating equipment, the document advises:

Developments proposing plant, ventilation, air extraction or conditioning equipment and flues will need to provide the system's technical specifications to the Council accompanying any acoustic report. 'BS4142 Method for rating Industrial and Commercial Sound' contains guidance and standards which should also be considered within the acoustic report.

There are however likely to be instances where the Council will consider that a BS4142 assessment alone is not sufficient to provide all the information necessary. Plant such as electrical substations for example, may meet BS4142 standards, but are also known to emit low frequency noise, which also needs to be considered. Developers are therefore encouraged to discuss proposals of this nature with the Council's Noise team before preparing their acoustic report - Email: RegulatoryServices@camden.gov.uk.

Plant, ventilation, air extraction or conditioning equipment and flues can cause disturbance to residential properties. The Council would therefore welcome the use of long-term maintenance agreements to ensure that equipment maintains

acceptable noise levels over its lifetime and the use of timers to limit any unnecessary operation of the equipment.

3.6.4 The thresholds deemed to be acceptable are set out in Appendix 3 of the Local Plan, and are copied below:

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required.*

In addition, a frequency analysis (to include the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times

of occupation for types of development and will be amended according to the times of operation of the establishment under consideration. There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

4. RELEVANT ACOUSTIC STANDARDS

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

4.1.1 There is much guidance on the levels of intrusive noise which would be considered acceptable within residential accommodation such as this. Typical advice is found in British Standard 8233:2014 “Guidance on Sound Insulation and Noise Reduction for buildings”. Following similar guidance in the 1999 World Health Organisation report "Guidelines for Community Noise", the Standard sets out the following limits for indoor ambient noise levels within living rooms and bedrooms. This suggests:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	35 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	40 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	35 dB(A) LAeq, 16 hr	30 dB(A) LAeq, 8 hr

Table 4.1 - BS8233 Indoor Guideline Values

4.1.2 It is usually considered that an open window will provide a reduction of some 10-15 dB(A)[2]. Therefore the 'good' internal standards quoted above would broadly equate to the following targets immediately outside the buildings:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	48 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	53 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	48 dB(A) LAeq, 16 hr	43 dB(A) LAeq, 8 hr

Table 4.2 - BS8233 Derived Facade Guideline Values

4.1.3 BS8233 recognises that, where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB, and reasonable conditions will be achieved.

4.1.4 It should be noted that the levels quoted in BS8233 are intended to reflect the acceptability of steady, continuous noise. Sources of intermittent and tonal noise may generate greater annoyance for a similar overall magnitude. Whilst BS8233 does not explicitly state a correction for those circumstances, it may be appropriate to consider that the Good and Reasonable standards would be achieved with levels which are perhaps 5 dB lower than stated in the table above.

4.1.5 It is also noted that BS8233 was written from a view of designing new buildings to protect occupants from existing noise sources. This does necessarily infer, however, that the acceptability of an occupant to an absolute level noise within a building will be different if the introduction of the noise source post-dates the construction of the building.

[2] Reference PPG24 Planning & Noise, which adopted a mid-range value of 13 dB(A)

4.2 World Health Organisation Guidelines

4.2.1 Further advice is provided in the 1999 WHO report "Guidelines for Community Noise".

4.2.2 This indicates that the steady noise level in external amenity areas, such as gardens or outdoor living areas should not exceed 55 dB(A) $L_{Aeq,\ t}$, and should preferably be designed below 50 dB(A) $L_{Aeq,\ t}$.

4.2.3 The document also provides guidance on the impact of peak noise levels on sleeping conditions. This suggests that levels above 45 dB(A) L_{Amax} inside a bedroom would be disturbing to sleep. With windows open, this would equate to a level of approximately 58 dB(A) L_{Amax} externally.

4.3 BS4142:2014 - 'Method for Rating and Assessing Industrial and Commercial Sound'

4.3.1 Any formal assessment of commercial noise affecting residential properties would in all likelihood be based upon the recommendations of British Standard 4142:2014 "Methods for rating and assessing industrial and commercial sound".

4.3.2 In brief, this rating method determines "specific sound level" generated by the new plant, assessed immediately outside the residential properties most likely to be affected. For daytime (07.00 – 23.00 hrs) only operation of the new plant, this would be the equivalent continuous noise level of the new noise, evaluated over a 1hr sampling period, its $L_{Aeq,1hr}$. For plant operating during the night-time (23.00 – 07.00 hrs) only the reference time interval is 15 minutes.

4.3.3 Corrections of up to + 9 dB (A) are then made to this “specific sound level” if the new noise has certain acoustic features such as tonality, impulsivity, intermittency and any other sound characteristics, to give the "rating level".

4.3.4 An assessment of the impact of the specific sound level can be determined by subtracting the measured background level from the rating level and consider the following.

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level,

this is an indication of the specific sound source having a low impact, depending on the context.

NOTE: Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

5. EXISTING AMBIENT NOISE CLIMATE

5.1 The first step in the assessment of potential impact is to measure and describe the existing ambient noise levels in the vicinity of the site.

5.2 A noise survey was undertaken at the site, from Thursday 4th October 2023 to Wednesday 10th October 2023.

5.3 As direct access to the residential properties on Parker Mews and Parker Street was not possible, an environmental noise level meter was positioned on the south-east corner of the theatre roof, as close to those buildings as possible (see Figure 1)[3].

5.4 The microphone was set on a lighting standard, at a height of c2m above the roof level (and therefore clear of the parapet wall which runs around the edge of the roof).

5.5 The equipment was configured to measure 15 minute samples of the following acoustic parameters:

L_{Aeq} The A-weighted equivalent continuous sound pressure level which, over the sample period, contains the same acoustic energy as the time-varying signal being recorded.

L_{Amax} The A-weighted maximum sound pressure level recorded during each sample period (as measured on fast response).

L_{A90} A statistical parameter representing the A-Weighted noise level exceeded for 90% of each sample period. This is commonly used to describe the underlying background noise levels.

5.6 Weather conditions throughout the survey period are summarized in the following table;

Date	Average Temperature (°C)	Events	Average Wind Speed m/sec	Wind Direction
Thursday 4/1/24	7	Rain o/n	3.1	N
Friday 5/1/24	6	Rain o/n	2.2	NW
Saturday 6/1/24	6	None	1.3	N
Sunday 7/1/24	4	None	2.2	N
Monday 8/1/24	2	Sleet pm	2.6	NE
Tuesday 9/1/24	3	None	3.5	NE
Wednesday 10/1/24	2	none	2.2	NE

Table 5.1 – Summary of Weather Conditions

[3] Rion NL52 SLM, S/N 620943, Calibration Certificate 1143075 (11th April 2023)

5.7 The equipment was calibrated before and after the survey and showed no significant variance.

5.8 Figure 2 shows the variation in noise levels. It can be seen the measure of the underlying background sound, LA90, remained relatively constant throughout the survey. This was due to the operation of extract equipment located on the lower roof, at the level of the survey (at varying distances of 5 – 10m from the survey location. Noise from the existing chiller, on the uppermost roof level, was not audible.

5.9 The survey data has been analysed to determine the range of background noise levels, L_{A90}, recorded in each position. WCC's policy for the control of noise from new plant or activity sets the limits in relation to the lowest level of existing background noise. Table 5.2 summarises these values, as measured in each location:

Period		**Day Time 0700 – 2300**	**Night-Time 2300 – 0700**
Min Background Level	dB(A)	55	54

Table 5.2 – Lowest Levels of Existing Background Noise, L_{A90}

5.10 The significance of the survey data will be discussed below.

6. DESIGN LIMITS FOR NEW BUILDING SERVICES PLANT

6.1 The lowest existing ambient noise level on the edge of the theatre roof is 54 - 55 dB L_{A90}.

6.2 This level is determined by various plant located 5 – 10m from the survey position. The nearest residential facades (at 20 Parker Mews) are themselves some 10m from the same equipment. Noise levels there may be up to 6 dB lower, due to the additional distance.

6.3 For the purposes of this assessment, it will be taken that the representative background noise level at residential neighbours is 48 - 49 dB(A) L_{A90}.

6.4 Adopting the guidance in Appendix 3 of the Camden Local Plan, it is recommended that noise from the replacement chiller is limited to the sound levels at the residential facades.

Period	**Day Time Periods 0700 – 2300**		**Night Time Periods 2300 – 0700**	
Noise Type	**General**	**Tonal / Intermittent**	**General**	**Tonal / Intermittent**
Location:				
Residential Properties	**39**	**34**	**38**	**33**

Table 6.1 – Design Limits (LAeq, t) for New Building Services Plant, dB(A)

7. ASSESSMENT OF CHILLER NOISE

7.1 Camden Noise Policy

7.1.1 Figures 3 – 5 show the general arrangement of the replacement chillers.

7.1.2 The installation will comprise 2 No. AermexcNRG 1100 chiller units (each comprising six cooling fans). Each unit has an acoustic package applied (by Allaway Acoustics), and the certified noise level from the attenuated chiller is 44.5 dB(A) at a distance of 10m (in free field conditions).

7.1.3 The units will be located within the same acoustic louvre compound as the existing units. However, it is noted that, with the increased height and footprint of the attenuated chillers, it will be necessary to reconfigure the existing louvre compound. The current plant area is approximately 7.5m x 5.5m x 2.3m high. The new plant area will be approximately 10m x 8.5m x 3.5m high. Providing the screening is provided in the form of a 300mm deep standard acoustic louvre (nom. Rw 17dB) as existing, the acoustic protection to the chillers will be retained.

7.1.4 Appendix 1 provides a calculation of noise from the attenuated and enclosure chiller compound to the nearest residential property (some 15m away). The result is a predicted façade noise level of 36dB(A).

7.1.5 It is not expected that the noise profile from the first attenuated and then screened chillers will be tonal in nature. Furthermore, with additional contribution of 35 dB(A) within an ambient noise climate of 50 dB(A), the sound of the chiller will be barely perceptible.

7.1.6 Therefore, it is concluded that the absolute noise from the new chillers (36 dB(A)) will be at least 2 dB below the limits derived from the Local Authority noise policy (38 dB(A)), and as such will be acceptable.

7.2 Comparison of Equipment

7.2.1 As discussed above, the new chillers (with their attenuation package) are each rated at 44.5 dB(A) at a distance of 10m.

7.2.2 The existing chillers have been operated for many years with the necessary consents, and without complaint. These units were an comprised a three-fan unit and a six-fan unit.

7.2.3 The overall sound power levels for the units were confirmed to be 72 and 75 dB(A) , respectively.

7.2.4 The equivalent sound pressure level from each unit is 41 dB(A) and 44 dB(A) respectively.

7.2.5 The combined sound pressure from the two existing units is therefore 46 dB(A) at a distance of 10m, compared to an equivalent level of 47dB(A) from the new units.

7.2.6 With equal screening of the plant compound and distances from the compound to the nearest noise sensitive receptors, the new installation represents a 1 dB increment compared to the equipment being replaced.

7.2.7 In itself, this represents a change in level of negligible significance, and would not be expected to be perceptible.

7.2.8 However, the impact will be less than this, since observations indicate that noise from other noise sources locally dominate the current situation. Therefore a 1 dB change in noise emanating from the chillers will not give rise to a 1 dB change in overall noise levels at neighbouring properties.

7.2.9 Therefore, it is concluded that the replacement of the chillers will, in relative terms, have no impact locally.

APPENDIX 1 – PREDICTIONS OF CHILLER NOISE LEVELS

Frequency	Hz	63	125	250	500	1K	2K	4K	8K	dB(A)
Aermec NRG 1100, SPL @10m	dB	44	47	40	44	41	35	29	25	**45**
Two number Units	dB	3	3	3	3	3	3	3	3	
Distance correction from 10m to 15m	dB	-4	-4	-4	-4	-4	-4	-4	-4	
Loss through 300mm acoustic louvres	dB	-6	-8	-10	-12	-15	-13	-10	-8	
Façade Correction	dB	3	3	3	3	3	3	3	3	
Net SPL at NSR Façade	**dB**	**40**	**41**	**32**	**34**	**28**	**24**	**21**	**19**	**35**

Figure 1 – Gillian Lynne Theatre Location

Figure 2 – Measured Sound Levels

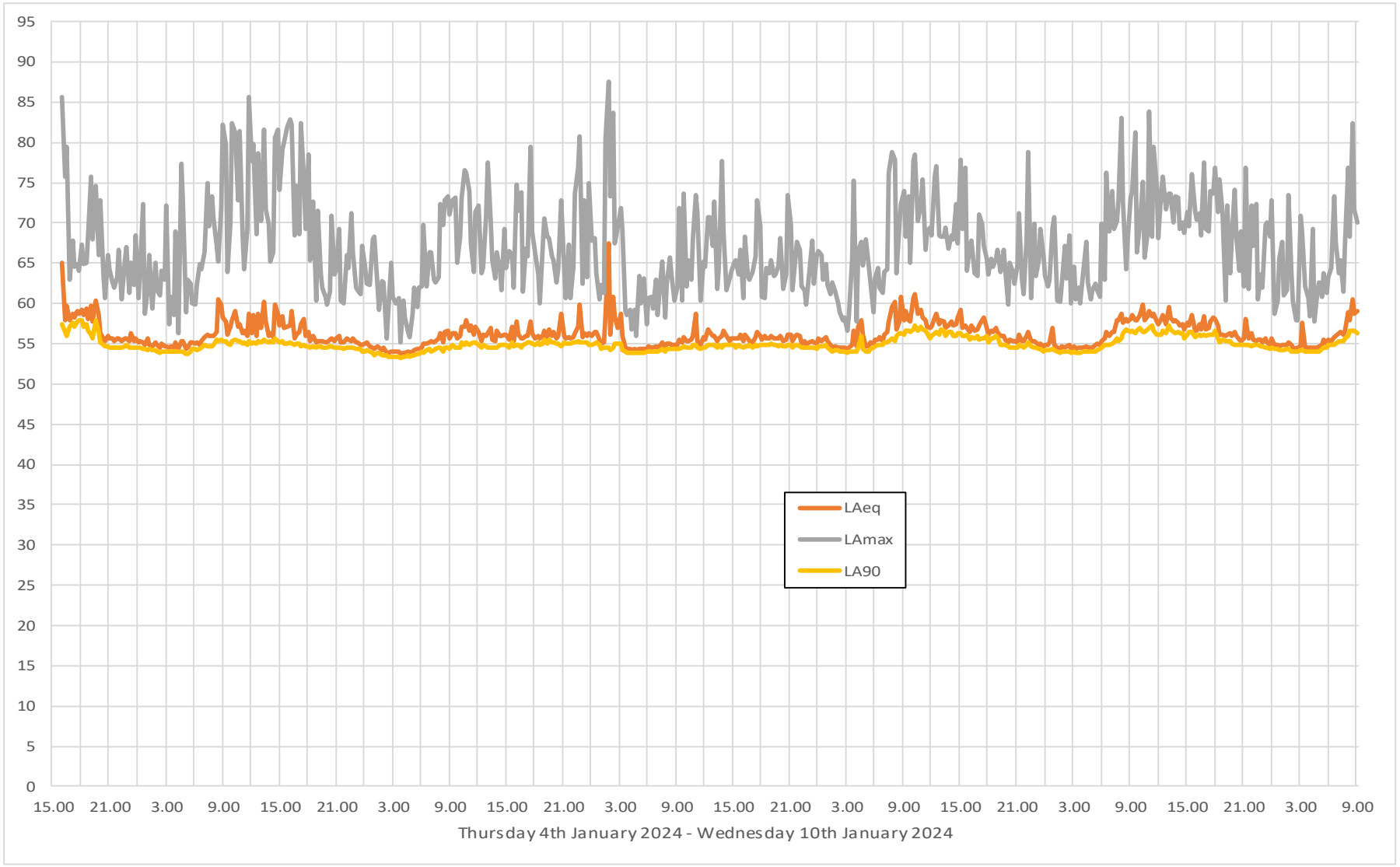

Figure 3 – Existing Chiller Compound

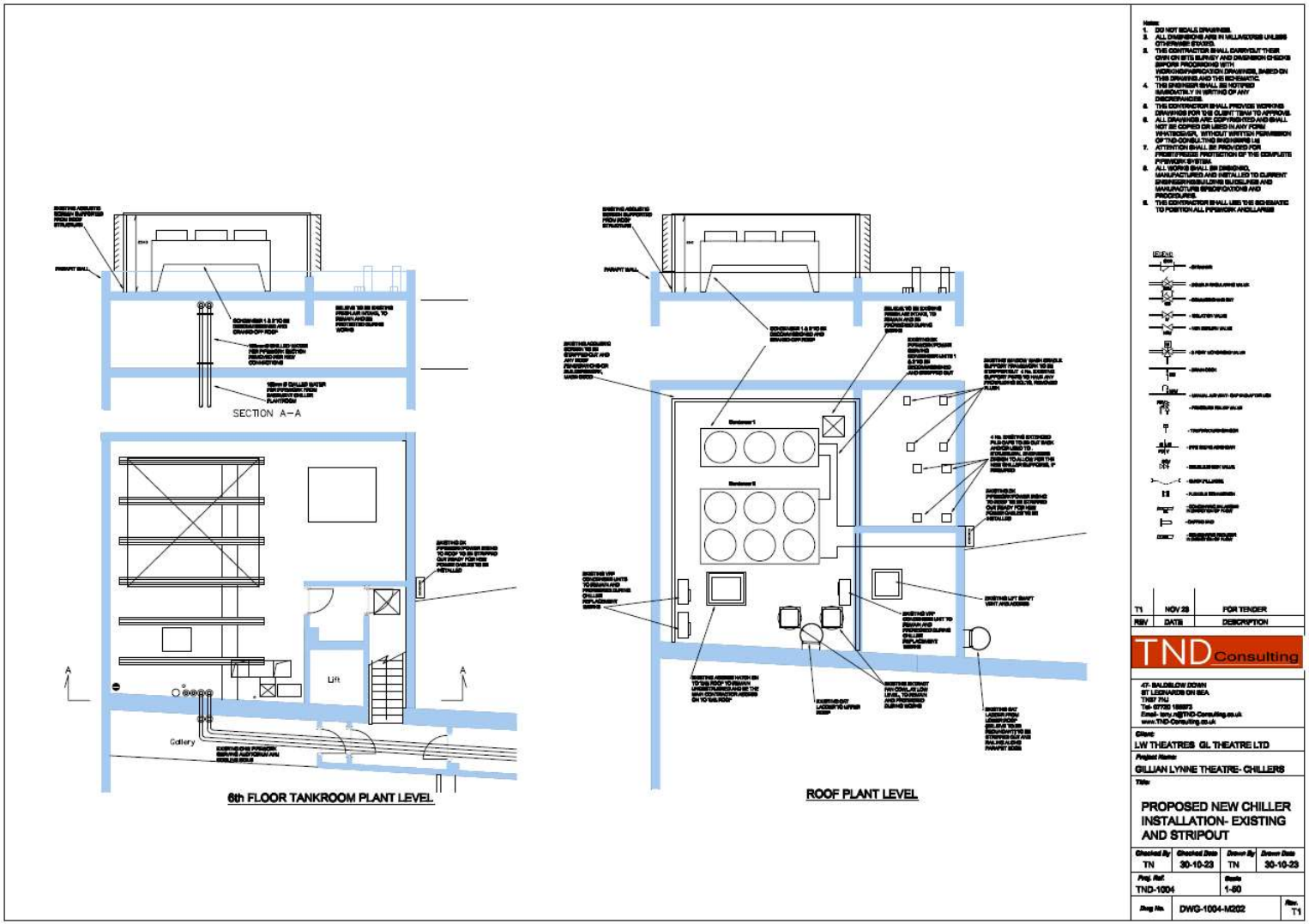

Figure 4 – Proposed Chiller Compound Plan

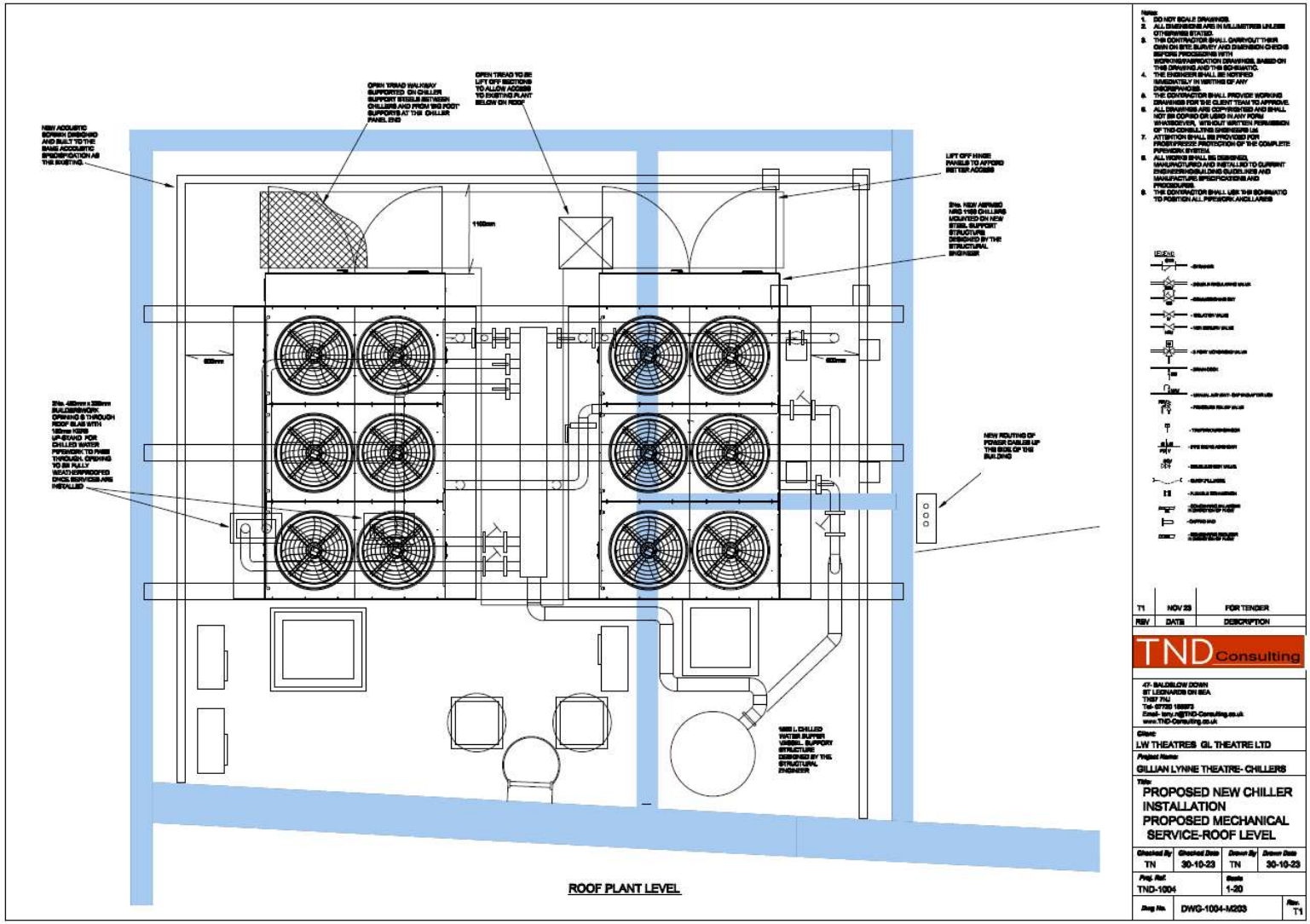

Figure 5 – Proposed Chiller Compound Section