

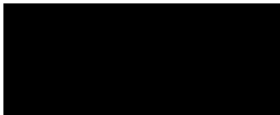
Butlin's Bognor Regis Temporary Venue

Noise Impact Assessment

010

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1.0 INTRODUCTION

This document is intended to provide acoustic context for the planning application related to the introduction of a temporary entertainment venue at Butlin's Bognor Regis.

The report covers relevant policies and guidance, a description and results of the long-term noise survey used to establish existing ambient and background noise levels at the site, as well as commentary on the likelihood of disturbance at NSRs from music noise within the temporary venue.

It should be read in conjunction with all other supporting information which accompanies this planning application.

Max Fordham LLP Acoustics Team is a corporate member of the Association of Noise Consultants (ANC). A glossary of the common acoustic terms used in this report is given in Appendix A, for reference.

2.0 POLICY BASIS

2.1 Statutory Noise Nuisance

Councils have a responsibility to investigate current or potential sources of noise nuisance, as defined by the *Environmental Protection Act 1990* as "noise emitted from premises so as to be prejudicial to health or a nuisance". The legislation does not explicitly provide guidance on the levels or types of noise that meet these criteria.

Therefore, an assessment of the potential impact of a specific noise source must be made with consideration to the context and nature of the noise, making reference to the best available commonly accepted guidance.

2.2 National Planning Policy

National Planning Policy Framework, 2019

Planning Policy Guidance Note 24 (PPG24), which was generally used for overall guidance to planners regarding environmental noise, particularly for residential sites, was replaced in March 2012 by the more general advice given in the National Planning Policy Framework (NPPF).

Noise Policy Statement for England, 2010

The Noise Policy Statement for England (NPSE) sets out (paragraph 1.6) the long-term vision of Government noise policy: "Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

2.3 The Code of Practice on Environmental Noise Control at Concerts

The Code of Practice on Environmental Noise Control at Concerts ("CoP"), produced by the Noise Council in 1990, is a design and management guide intended to minimise the impact of music noise from music venues. Within the introduction, its purpose is described thus:

Various guidelines and criteria are described in this document covering a range of events from the single occasional concert to a full season. It is believed that compliance with the guidelines and the other advice given here will enable successful concerts to be held whilst keeping to a minimum the disturbance caused by noise.

[...]

This Code is designed to assist those planning a music event, those responsible for licensing such events and those responsible for enforcing the nuisance provisions of the Environmental Protection Act 1990.

A-Weighted Noise Levels

Table 1 within the document provides guideline noise levels for different venues for events before 2300 hrs, based on the predicted number of concert days per calendar year. The maximum number of concert days listed in Table 1 is 12, which is significantly lower than will be programmed within the proposed venue.

In the notes attached to Table 1, however, the following clause is included.

For indoor venues used for up to about 30 events per calendar year an MNL not exceeding the background noise by more than 5dBA over a fifteen minute period is recommended for events finishing no later than 2300 hours.

All events in the proposed venue shall finish no later than 2300 hrs.

Although the proposed venue is proposed to be used for more than 30 events a year, there is no guidance for events occurring more frequently than 30 times a year.

An indicative programme of events intended to take place within the temporary venue is included within this planning application. In general, two main categories of events are proposed. This report deals with those which make full use of the PA system to play live reproduced music, as they will produce the highest levels of noise.

The other category of events is those in which the sound is mostly generated by audience participation or other crowd noise. Modelling which assumes that every audience member in the venue at maximum capacity is shouting in unison, which is an extreme worst-case scenario for this type of noise, suggests that the speech level within the temporary venue would not exceed **87dBA**, well below the level produced by the PA system.

In addition, it should be noted that, under restrictions to control Coronavirus, no audience participation or “sing-alongs” are permitted.

It can therefore be said with certainty that the noise assessed within this document represents the worst case of the proposed uses of the temporary venue and that for other uses which are dominated by crowd noise the noise level is likely to be at least 10dBA lower.

Low Frequency Noise Levels

The document also contains this commentary on low frequency noise:

Assessment of noise in terms of dB(A) is very convenient but it can underestimate the intrusiveness of low frequency noise. Furthermore, low frequency noise can be very noticeable indoors. Thus, even if the dB(A) guideline is being met, unreasonable disturbance may be occurring because of the low frequency noise. With certain types of events, therefore, it may be necessary to set an additional criterion in terms of low frequency noise, or apply additional control measures.

[...]

A level of up to 70dB in either of the 63Hz or 125Hz octave frequency band is satisfactory; a level of 80dB or more in either of those octave frequency bands causes significant disturbance.

These two criteria form the basis of the existing Butlin’s noise management plan and will be used to assess the likelihood of disturbance from sound related to the proposed temporary venue.

2.4 BS 4142:2014

British Standard 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ (“BS 4142”), is a widely accepted method for assessment of the impact of noise from plant equipment.

The total free-field noise level generated by a plant source, measured at the façade of a nearby noise sensitive receiver – referred to as the Specific Plant Noise Level – is corrected to account for characteristics such as tonality and intermittency. This corrected figure – referred to as the Noise Rating level – is compared against the “representative” background noise level without the noise source operating.

With reference to the “representative” background sound level, stating that “...the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods”. A commonly used determination of this is made by taking the 40th percentile of measured values within the reference time period.

Where the rating level does not exceed the background level, BS 4142 describes this as “an indication of the specific noise source having a low impact, depending on the context”.

3.0 EXISTING NOISE ENVIRONMENT

3.1 Noise Survey

To assess existing noise levels at the site, an MFLP engineer measured noise data in a position in an unused area of land towards the East of the site (marked in **Figure 1**) from 11th-13th November 2020 using a Class 1 Integrating Sound Level Meter, as seen in **Figure 2**. Details of calibration certificates for all relevant equipment can be found in an **Appendix B**.

The closest weather station providing readily available public data for the measurement period is located in Royal Tunbridge Wells, approximately 50 miles from the site. The data from this weather station indicates that temperatures vary in the range 9-13°C during the measurement period. The temperature in Bognor will not differ greatly from those at the weather station and temperature is not likely to have any significant impact on the noise measurements. No significant rainfall was noted during the measurement period.

High winds, which had the potential to contaminate noise level measurements, occurred during an approximately 7-hour period at the beginning of the measurement period. This period, which is highlighted in yellow in **Figure 2**, has been excluded from calculations of overall noise levels across the survey duration.

The survey location was chosen to be as representative of the background noise levels at the residential properties bordering the Butlin’s site with the lowest predicted levels of background noise, to the southern end of Sea Road. The low noise levels in these areas are a result of their distance from major roads, which are the main source of noise in the area.

Background noise levels (L_{AF90}) typically do not vary with location to the same degree as average noise levels (L_{Aeq}), as the sources of noise tend to be more spatially and temporarily distributed. It is therefore judged that background noise levels measured at the survey location are likely to be representative of all the most sensitive NSRs to the East.



Figure 1: A site plan showing the site boundary of the Butlin's site in red, as well as the locations of the measurement positions, nearest noise sensitive receiver and the approximate location of the proposed venue. Imagery courtesy of Google.

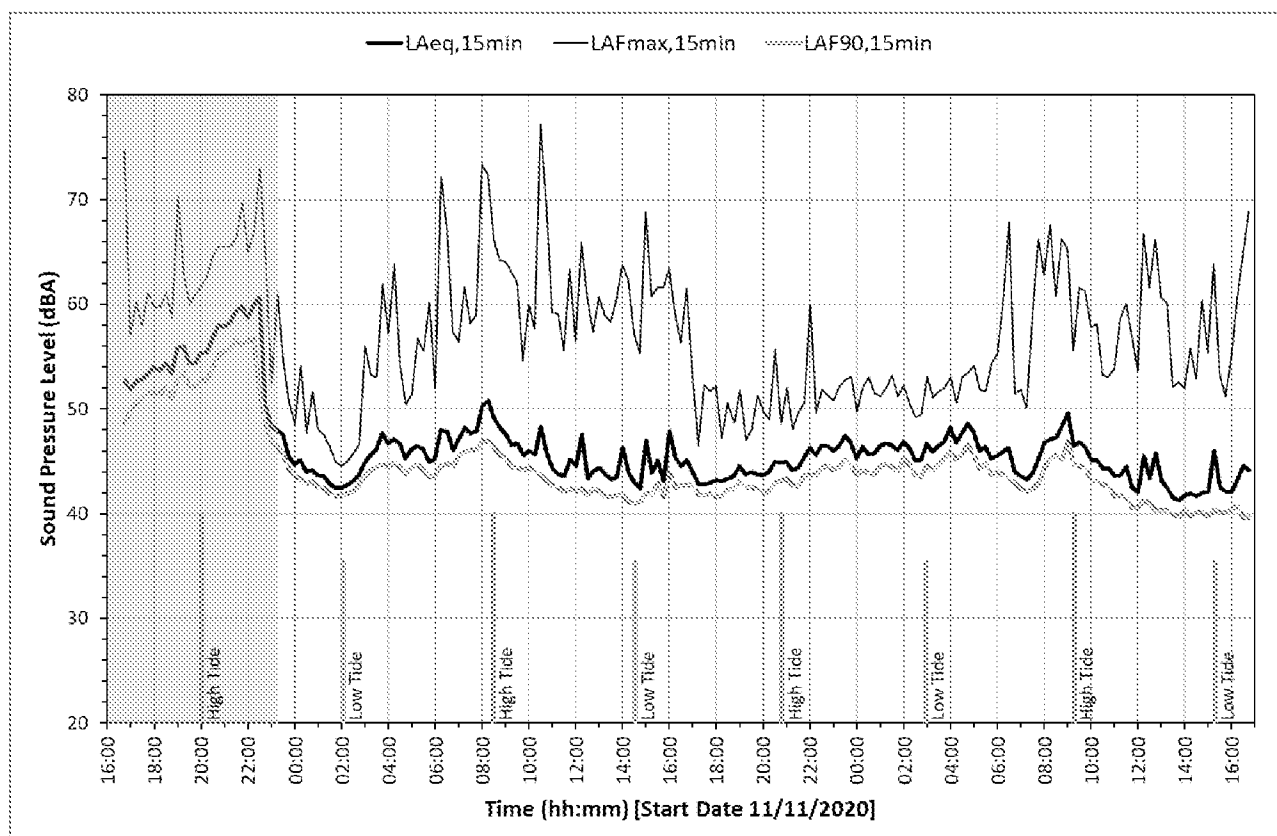


Figure 2: The noise levels measured during in the survey across the survey duration, with the area excluded from the calculations due to high wind highlighted in yellow. Approximate tide times shown for reference.

Daytime average	Night time average	Night time maximum	Daytime background	Night time background
45dB L _{Aeq,16hr}	46 dB L _{Aeq,8hr}	59dB L _{AFmax,15min} 90th percentile	42 dB L _{AF90,15min} 40th percentile	44 dB L _{AF90,15min} 40th percentile
Note: Daytime covers the period 0700-2300, night time covers the period 2300-0700.				

Figure 3: A summary of the noise levels measured across the survey.

The measured noise levels are consistently very low, with the noise field dominated by the steady sounds of sea and light wind in the trees on the site boundary. The variation in noise level across the survey period is not dominated by traffic sources, but rather by atmospheric and tidal factors.

Rather than showing a variation in noise levels representative of a day-night or weekly cycle, as is typically the case, the measured noise levels represent a “noise floor” which noise levels are unlikely to fall beneath, regardless of what other activities are taking place in the area. The measured background levels are therefore taken to be representative of weekend, as well as weekday, conditions.

As such, the levels measured during the daytime portions of this survey, which are slightly lower than those during the night due to variations of environmental factors such as tides, weather and wildlife across the measurement period, are taken to represent the minimum noise levels across a given 7-day period.

As these measurements were taken during a period of “lockdown” to combat the spread of Coronavirus, no noise related to typical activity from the Butlin’s site is included within these measurements. In addition, traffic levels are likely to have been lower than they would typically be. As such, these noise levels may well be uncharacteristically low for this location under unrestricted conditions.

The effect of these uncharacteristically low background noise level will be to make the analysis more onerous, as the music noise level will be higher in comparison. Therefore, any analysis undertaken using these measurements as a baseline should be considered conservative of the likely impact during unrestricted conditions.

When restrictions are lifted, additional background noise measurements will be taken, so that they may be compared to those measured in the noise survey. If the measured levels would result in a more onerous assessment of noise from the temporary venue, the assessment will be reviewed with reference made to the new, lower background noise levels. If appropriate, the level on the electronic limiter within the PA system will be reduced.

Some national or regional restrictions may still be in place when the venue begins operating. In this case, the background noise levels measured during this survey are likely to be representative of the worst-case scenario, being dominated as they are by natural sounds, independent of traffic or site activity.

The nature of this noise suggests that the noise levels measured at the measurement position are likely to be very similar to that at the façade of the nearby NSRs to the East, with no correction for distance from the source required.

3.2 Spot Measurements

In addition to the survey, a one-hour measurement was taken 10m from the side of Gloucester Road, in the location shown in **Figure 1**, between 1420-1520 hrs on 11th November 2020, in the location shown in **Figure 1**. The equipment used was the same as detailed above.

Noise levels in this area are judged to be representative of noise levels for sensitive receivers along the length of Gloucester Road, as the majority of traffic on Gloucester Road will travel its entire length, as Walton Road, the only turning off from Gloucester Road, is a small residential road.

This measurement showed average noise levels in this location of **62dB LAeq,1hr** and a representative (40th Percentile) background noise level of **53dB LA_F,90.**

As discussed above, due to low levels of traffic due to the Coronavirus restrictions, these noise levels may well be uncharacteristically low for this location. As stated above, however, the effect of the reduced noise levels will be to make the assessment more onerous than the equivalent measurements taken during a period of no restrictions.

As well as being the location of the closest NSR to the location of the proposed venue, the noise levels measured by Gloucester Road are judged to be fairly representative of the roads the West and the North of the site, namely Upper Bognor Road and the sections of the B2259 and High St. which run along the boundary of the Butlin's Site.

4.0 PREDICTED NOISE IMPACT

Noise produced by the Butlin's site is managed by the Butlin's Noise Management Plan (NMP). The NMP will be amended to include the temporary venue utilising the same methodology and principles as the existing venues, with the limits for Music Noise Level, as defined by the *CoP*, determined by following the measurements and analysis within this noise impact assessment.

As the assessment below is made using the same methodology as the existing NMP, the anticipated usage of the building is predicted to result in Music Noise Levels which would satisfy both the existing and proposed NMP. The nature or character of noise produced by the site is not anticipated to change significantly as a result of the introduction of the temporary venue.

4.1 Sound Insulation

The walls of the temporary structure are proposed to be formed of insulated panels – formed of a metal encapsulated mineral wool core – which are stated by the manufacturer to achieve a sound reduction index of **27dB R_w**. The data sheet for these panels is reproduced in **Appendix E**.

The glazed portions of the façade have been specified to achieve a performance that is at least as good as the insulated panels so as to maintain the overall sound insulation performance of the façade. The glazing is proposed to be a 3/2/2 build-up, with a modelled performance of **29dB R_w**.

As the proposed space shall be mechanically cooled and ventilated, doors and other openings will be closed during periods of occupation, so that these systems operate efficiently. As events are to be pre-booked, the majority of guests will not be using the outer doors during the performance. The façade will therefore be sealed during performances, apart from brief periods when doors are opened to allow access.

The roof of the temporary structure is proposed to be formed of two layers of tensioned fabric with a pressurised air layer between them. This forms a series of inflated 'pillows' which have a higher level of sound insulation than traditional stretched canvas or plastic. Due to the lack of available test data for the tensioned roof layer, the assessment makes the conservative assumption that the roof provides no sound attenuation.

As detailed below, the design of the PA is such that sound energy is directed away from the roof, due to the lower sound insulation performance, relative to the walls.

4.2 PA Design

An electronic limiter is to be included within the PA design, which will be configured such that music noise levels produced by the PA system may not exceed a given level. While this level is yet to be defined as part of

the final PA design, it shall be no more than **100dBA** when measured at the mixing desk, which will provide a level between **96dBA** to **100dBA** across the audience plane.

Analysis of the PA system, carried out by Star Group Live, is reproduced in **Appendix D**.

Once the system has been calibrated, measurements will be made of the noise during use of the venue indicative of worst-case usage (in this case a live music performance). If the levels of noise produced by the completed structure are found to exceed the noise level limits required by the *CoP* at the most affected NSR, the electronic limiter system will be recalibrated to ensure that the noise limits are met.

Care has been taken when designing the PA system to ensure that the sound is concentrated within the audience area as evenly as possible, while minimising the spill of sound outside this area. As such, 2 rows of delay speakers are included, in addition to the main arrays at the front of the stage. These additional speakers reduce the sound levels required from each array to ensure sufficient level at the rear of the venue.

In addition, the directivity of each speaker array has been optimised to direct sound away from the roof and the glazed areas of the wall. Therefore, at mid-frequencies the levels at the underside of the roof are predicted to typically be around **10dB** or more below the level at the audience plane. With the limiter in place, this suggests that typical maximum levels at this height will not exceed **90dB** at mid frequencies. As the directivity effect varies with frequency, the conservative assumption has been made to assume no effect of directivity in the predicted noise calculation.

4.3 Predicted Noise Break-Out

Considering the sound insulation and PA Design factors described above, an estimation of the typical noise levels at 1m from the façade of the proposed can be made, so that it may be compared for reference to the limit given by following the guidance of the *Code of Practice*.

In order to do so, a typical rock music spectrum has been taken from Niels Werner Adelman-Larsen's 2014 book *Rock and Pop Venues*. This indicative spectrum is based on measurements on 15 rock and pop acts in the same indoor venue. While the spectrum within the venue will vary from event to event, a rock music spectrum is likely to be close to the worst-case, due to the high levels of low-frequency noise. The effect of the spectrum on the overall levels of noise which break out from the venue will be minimal.

This spectrum that suggests that, for an A-weighted level within the venue of **100dBA**, the levels in the 63Hz and 125Hz octave bands would be in the region of **112dB** and **104dB**, respectively.

The noise break-out from the venue is formed of two main contributions; the sound which passes through the insulated panels of the walls, and the sound which passes above the walls, through the roof.

The sound which passes through the walls will be attenuated by the sound insulation performance of the insulated panels, which, as stated above, provide a sound reduction index of **27dB R_w**. The sound which passes through the roof is attenuated by the barrier effect of the walls – in a similar manner to a plant enclosure – the effect of which can be predicted by a commonly used formula.

As stated above, the attenuation of the noise breaking out through the roof has not been included. Similarly, the directivity of the speakers has not been accounted for in this calculation, so as to remove as much uncertainty as possible. Both these factors are expected to result in lower in-use Music Noise Levels at the NSRs than are predicted here.

The total sound pressure breaking out from the venue can be estimated by logarithmically summing the contributions of these two paths together at a given distance. The relative contributions of the two paths vary depending on the distance, as the shielding effect lessens while the attenuation due to spherical propagation increases.

All NSRs that are further from the venue than the NSRs for which the assessment is carried out here will benefit from an increased level of attenuation due to spherical propagation. Therefore, the music noise level at all other NSRs can be expected to be lower than those described in this report.

Figure 4 shows the predicted levels at 1m from the façade, 1.5m from the ground as an example of the contributions of these two paths, showing the “noise shadow” effect of the shielding from the walls on the level through the roof and the effect of logarithmically adding the two paths. The MNL levels in **Figure 5** and **Figure 6** have been predicted using the same methodology. **Appendix C** details the contributions from each path that have been used to calculate the total levels shown in **Figure 5** and **Figure 6**.

	63 Hz	125 Hz	A-w
Predicted max. MNL within Venue	112 dB L_{eq}	104 dB L_{eq}	100 dB L_{Aeq}
Predicted max. MNL through Walls at 1m from Venue	98 dB L_{eq}	87 dB L_{eq}	79 dB L_{Aeq}
Predicted max. MNL through Roof at 1m from Venue	71 dB L_{eq}	60 dB L_{eq}	51 dB L_{Aeq}
Predicted max. Total MNL at 1m from Venue	98 dB L_{eq}	87 dB L_{eq}	79 dB L_{Aeq}

Figure 4: A prediction of the internal and external music noise levels associated with the proposed venue, showing the contributions of the two main sound paths.

4.4 Impact to NSRs to the East

The minimum distance between the proposed location of the temporary venue and the nearest noise sensitive receiver to the East is around **450m**, with the most sensitive residences being the one-or-two storey houses at the southern end of Sea Road.

In practice, the level difference between the venue and the NSRs to the East will be significantly higher than predicted by the methodology above, as several structures within the Butlin’s site – most notably the Shoreline Hotel, immediately to the east of the proposed location of the temporary venue – shall provide an additional effect to the noise sensitive receivers.

The additional level difference provided by this shielding is predicted to be at least **20dB**. However, due to the uncertainty in this figure it is not included in this assessment. This is a cautious approach that will likely result in the noise level at the assessment position being over-estimated in this assessment.

Due to the reduced shielding effect from the side walls, the most affected part of the NSR is predicted to be the top-most floor. The most sensitive NSRs to the East are one-or-two storey houses, and the noise is therefore predicted at a height of 4.5m.

	63 Hz	125 Hz	A-w
Measured Background Level	-	-	42 dB L_{A90}
Limit at 1m from East NSR	70 dB L_{eq}	70 dB L_{eq}	47 dB L_{Aeq}
Predicted max. MNL at 1m from East NSR	49 dB L_{eq}	40 dB L_{eq}	35 dB L_{Aeq}

Figure 5: The measured background noise and derived limits for Music Noise Level (MNL) to comply with The Code of Practice on Environmental Noise Control at Concerts for NSRs to the East. Note that the 63Hz and 125Hz octave band limits are not based on the background level.

As can be seen in **Figure 5**, based on the considerations described above, the predicted maximum MNLs at the NSRs to the East is considerably below the limit suggest by the *Code of Practice*.

As several potential sources of attenuation have not been included within the assessments, including the attenuation provided by the roof, the directivity of the speakers and the shielding of other buildings, it is likely that the maximum MNL under real use of the space will be significantly lower than that shown in **Figure 5**.

4.5 Impact to NSRs to the West

The distance between the proposed site of the temporary venue and the nearest noise sensitive receiver to the West is around **160m**. The most sensitive NSRs are the flats at Compass Point, as they are the tallest properties along Gloucester Road and will therefore benefit least from the shielding effect from the walls of the temporary structure.

For these NSRs, the background level measured during the spot measurement - just to the North along Gloucester Road - is taken as representative.

As the NSRs on Seaward Way include 6 storey buildings, the noise levels are predicted here for a height of 18m. At this height, the NSR has line-of-sight over the walls of the venue so, as can be seen in **Appendix C**, the Music Noise Level is dominated by transmission through the roof.

	63 Hz	125 Hz	A-w
Measured Background Level	-	-	53 dB L_{A90}
Limit at 1m from West NSR	70 dB L_{eq}	70 dB L_{eq}	58 dB L_{Aeq}
Predicted Max. MNL at 1m from West NSR	58 dB L_{eq}	49 dB L_{eq}	49 dB L_{Aeq}

Figure 6: The measured background noise and derived limits for Music Noise Level (MNL) to comply with The Code of Practice on Environmental Noise Control at Concerts for NSRs to the West. Note that the 63Hz and 125Hz octave band limits are not based on the background level.

As can be seen in **Figure 6**, based on the considerations described above, the predicted maximum MNLs at the NSRs to the West is considerably below the limit suggested by the *Code of Practice*.

As above, it is likely that the difference between the maximum MNL under real use of the space will be significantly larger than the minimum shown in **Figure 6**, as several potential sources of attenuation have not been included within the assessments

4.6 Predicted Impact on Amenity

The document *WHO Guidelines for Community Noise* suggests maximum noise levels in a range of scenarios. In reference to noise levels in external amenity spaces, the document includes the following recommendations:

To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 50dB L_{Aeq} .

In reference to internal noise levels within dwellings, it says:

To enable casual conversation during daytime, the sound level of interfering noise should not exceed 35dB L_{Aeq} .

Elsewhere in this section, when discussing recommended maximum night-time noise levels, a noise reduction of 15dB from outside to inside with a window open is assumed. This suggests that, during the daytime, the level of 50dB L_{Aeq} which is said to protect the majority of people from being moderately annoyed outside would also provide a suitable internal noise level, even with windows open.

The internal noise level requirement of 35dB L_{Aeq} is also given in various other documents, including *BS 8233:2014 Guidance on sound insulation and noise reduction for buildings*.

As the predicted maximum music noise level at the Compass Point flats – the most affected NSR – is just below 50dBA, it can be taken that the WHO Guidelines suggests that the majority of people would not consider their internal or external amenity to be significantly impacted by noise from the temporary venue.

It should be noted that these noise requirements are suggested with reference to “steady, continuous noise”. Therefore, as an assessment methodology, it is not as well suited to the assessment of noise from entertainment sources as that of the *Code of Practice*, but still provides a useful benchmark.

5.0 PLANT NOISE

The noise-generating HVAC plant included within the proposed design consists of 2 air handling units – which draw in fresh air from outside the building and include indirect oil-fired heating units – and 45 air conditioning outdoor units. Manufacturers data sheets are reproduced in **Appendix E**.

These systems need only be operational during the hours of occupation – as well as a period to warm the space before use – and therefore will only operate during the daytime hours (0700-2300 hrs).

In the maximum duty heating mode, each air conditioning outdoor unit is indicated by the manufacturer to have a sound power level of **70dBA**, which would suggest a total sound power level of **87dBA** for all 45 units.

The AHU and heating unit are stated by the manufacturer to have a sound pressure level of **63dBA**, at 3m from the units when under full ventilation and heating load, which indicates a sound power of **84dBA** for each unit, and therefore **87dBA** in total.

This suggests that the total sound power of all plant associated with the proposed venue under maximum duty is **90dBA**.

5.1 Impact to NSRs to the East

Assuming hemispherical propagation, at 450m from the source of plant noise the predicted sound pressure level of this plant noise would be expected to be **29dBA**. Allowing for a 2dB penalty due to tonality – which BS 4142:2014 suggests is suitable to allow for “just perceptible” levels of tonality as can sometimes be associated with condenser units – suggests a plant noise rating level of **31dBA**.

This is a conservative estimate, as it assumes that the sound power of all plant is radiating from the closest point of the venue to the nearest NSR, when in reality it will be distributed more evenly than this. Additionally, the noise will be attenuated by shielding from other buildings around the site.

The representative daytime background level at the NSRs to the East, as discussed above, was measured at **42dBA**. The plant noise associated with the proposed venue can therefore be said to comfortably fall into the category which *BS 4142:2014* describes as an indication of low impact.

5.2 Impact to NSRs to the West

Assuming hemispherical propagation, at 160m from the source of plant noise the predicted sound pressure level of this plant noise would be expected to be **37dBA**. Allowing for the same penalty due to tonality as above suggests a plant noise rating level of **39dBA**.

As above, this assumes that all plant is radiating from the closest point of the venue to the nearest NSR and should therefore be considered conservative.

The representative daytime background level at the NSRs to the West, as discussed above, was measured at **53dBA**. The plant noise associated with the proposed venue can therefore be said to comfortably fall into the category which *BS 4142:2014* describes as an indication of low impact.

6.0 SUMMARY

- A new temporary entertainment venue is proposed within the existing Butlin's Bognor Regis site. The temporary venue shall operate only until 23.00hrs.
- The nature or character of noise produced by the site is not anticipated to change significantly as a result of the introduction of the temporary venue.
- MFLLP have measured existing noise levels on the site, during "lockdown" restrictions, so as to identify the background noise levels at the noise sensitive receiver that are representative of those experienced during the Coronavirus pandemic.
- The background noise levels as measured during "lockdown" are relevant to the proposed temporary venue as it is intended to be operated in the near future during the current Coronavirus pandemic and associated restrictions.
- These measurements were compared to a worst-case prediction of maximum levels of music noise at the façade of the noise sensitive receiver.
- The levels of music noise in this worst-case scenario are such that they satisfy the A-weighted and low-frequency requirements of the accepted guidance document for music.
- Due to the electronic limiter, which is to be included within the PA design, levels produced by the PA system will not be able to be raised above the level assumed as part of this assessment.
- Several sources of additional attenuation have not been included in this assessment, so as to limit uncertainty.
- It is therefore judged that there is low likelihood of negative impact from music from the proposed venue at the nearest residential receivers to the East and West.
- The predicted Music Noise Levels will satisfy the Butlin's Noise Management Plan, which will be amended to include reference to the proposed venue.
- The plant noise associated with the proposed venue falls into the category which *BS 4142:2014* describes as an indication of low impact.

7.0 APPENDICES

7.1 Appendix A – Glossary of Acoustic Terms

FREQUENCY, f (Herz, Hz)

The rate of vibration of the air molecules which transmit the sound measured in cycles per second or Hertz. The human ear is sensitive to sound in the range 20Hz – 20kHz.

SOUND PRESSURE LEVEL (SPL), L (dB)

The sound level measured on a logarithmic scale, with unit decibel dB. This scale is linearly weighted, as opposed to A-weighted (see below). A free-field SPL refers to a level determined far enough from surfaces or facades, apart from the ground, so as not to be influenced by reflections from those surfaces.

A-WEIGHTED SOUND PRESSURE LEVEL (SPL), L_A (dBA)

A-weighted SPL values (or noise levels) are weighted in a way that approximates the frequency response of the human ear and allows sound levels to be expressed as a single figure value.

EQUIVALENT CONTINUOUS A-WEIGHTED SPL, $L_{Aeq,T}$ (dBA)

Energy weighted average of the A-weighted sound pressure level over a time period, T . The level of a notional continuous sound that would deliver the same A-weighted sound energy as the actual fluctuating sound over the course of the defined time period, T .

MAXIMUM A-WEIGHTED SPL, L_{Amax} (dBA)

The maximum A-weighted sound pressure level measured. If not specified, usually assumed to mean L_{AFmax} , i.e. L_{Amax} determined with a 'fast' (F) sound level meter time constant of 125ms.

BACKGROUND NOISE, $L_{A90,T}$ (dBA)

The value of the A-weighted sound pressure level that is exceeded for 90% of any given time interval, T . This value is generally adopted as representing the background noise level of a given environment. If not specified, usually assumed to mean $L_{AF90,T}$, i.e. determined with a 'fast' (F) sound level meter time constant of 125ms.

7.2 Appendix B – Noise Survey Equipment Details

The equipment summarised in the table below has been calibrated by a UKAS accredited laboratory in accordance with the laboratory requirements of the United Kingdom Accreditation Service (UKAS) on the dates indicated.

Item	Make	Type	Serial no.	Calibration Intervals	Last Calibrated	Next Due Calibration	Calibration Certificate Number
Class 1 sound level meter	Norsonic	140	1405942	2 years	22/06/2020	22/06/2022	U28361 U28362
Microphone	Norsonic	1225	208215	2 years	22/06/2020	22/06/2022	28360
Microphone preamplifier	Norsonic	1209	15804	2 years	22/06/2020	22/06/2022	U28361 U28362
Calibrator	Norsonic	1251	34059	1 year	2/12/2019	1/12/2020	U33500

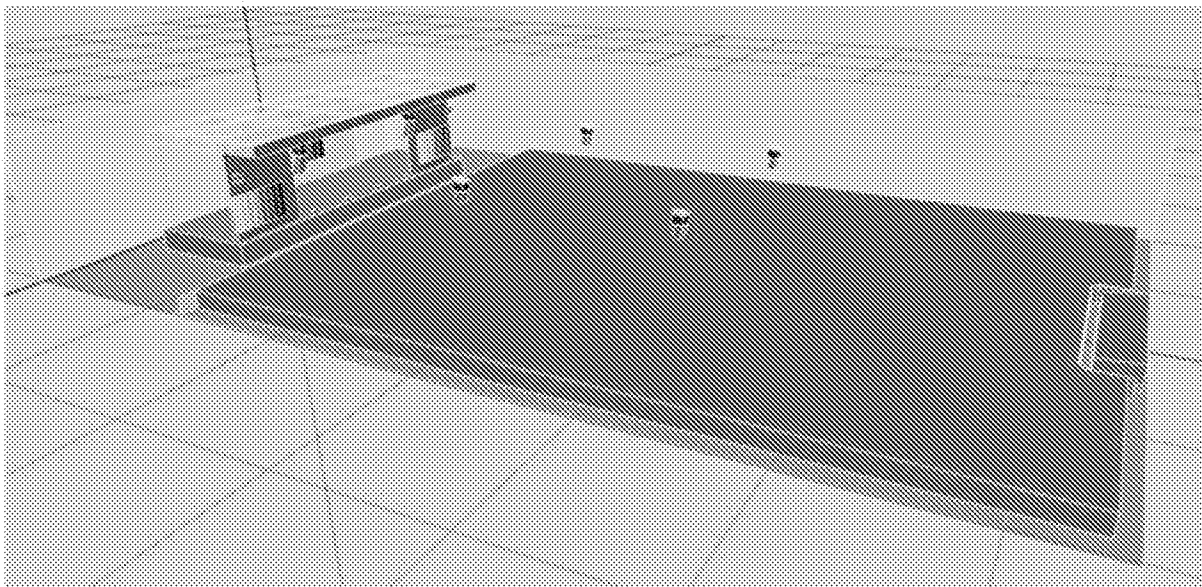
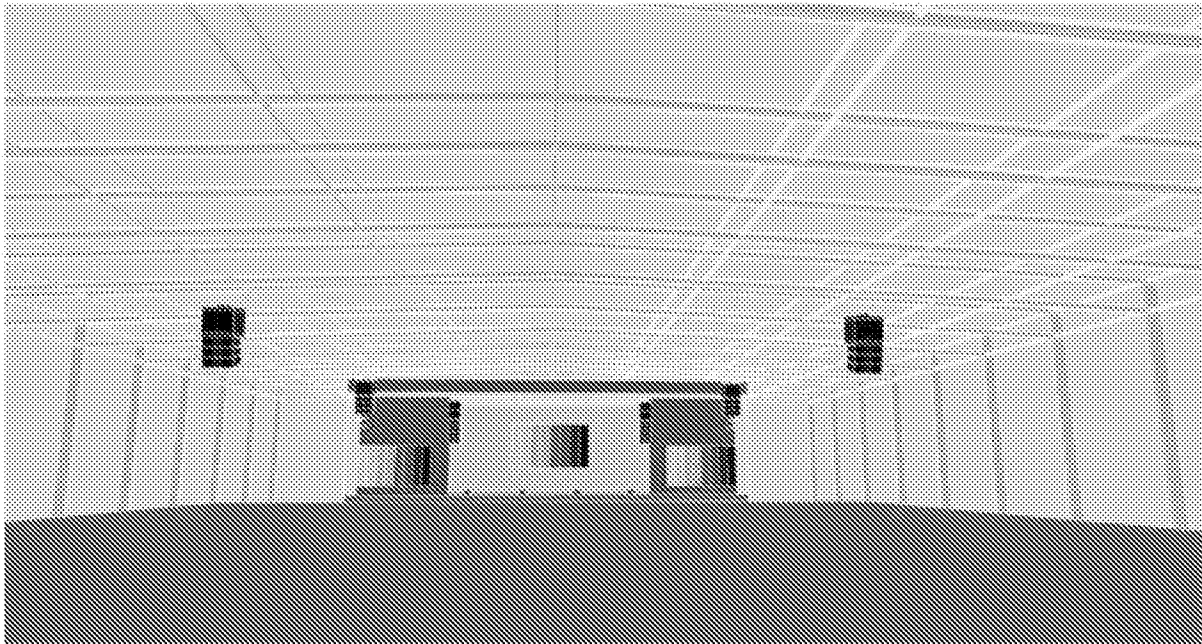
7.3 Appendix C – Predicted Music Noise Level Contributions at NSRs

Prediction of MNL at 1m from East NSRs	63 Hz	125 Hz	A-w
Predicted max. MNL within Venue	112 dB L _{eq}	104 dB L _{eq}	100 dB L _{Aeq}
Predicted max. MNL via Walls at 450m from Venue, 4.5m height	45 dB L _{eq}	34 dB L _{eq}	26 dB L _{Aeq}
Predicted max. MNL via Roof at 450m from Venue, 4.5m height	46 dB L _{eq}	38 dB L _{eq}	34 dB L _{Aeq}
Predicted max. Total MNL at 450m from Venue, 4.5m height	49 dB L _{eq}	40 dB L _{eq}	35 dB L _{Aeq}

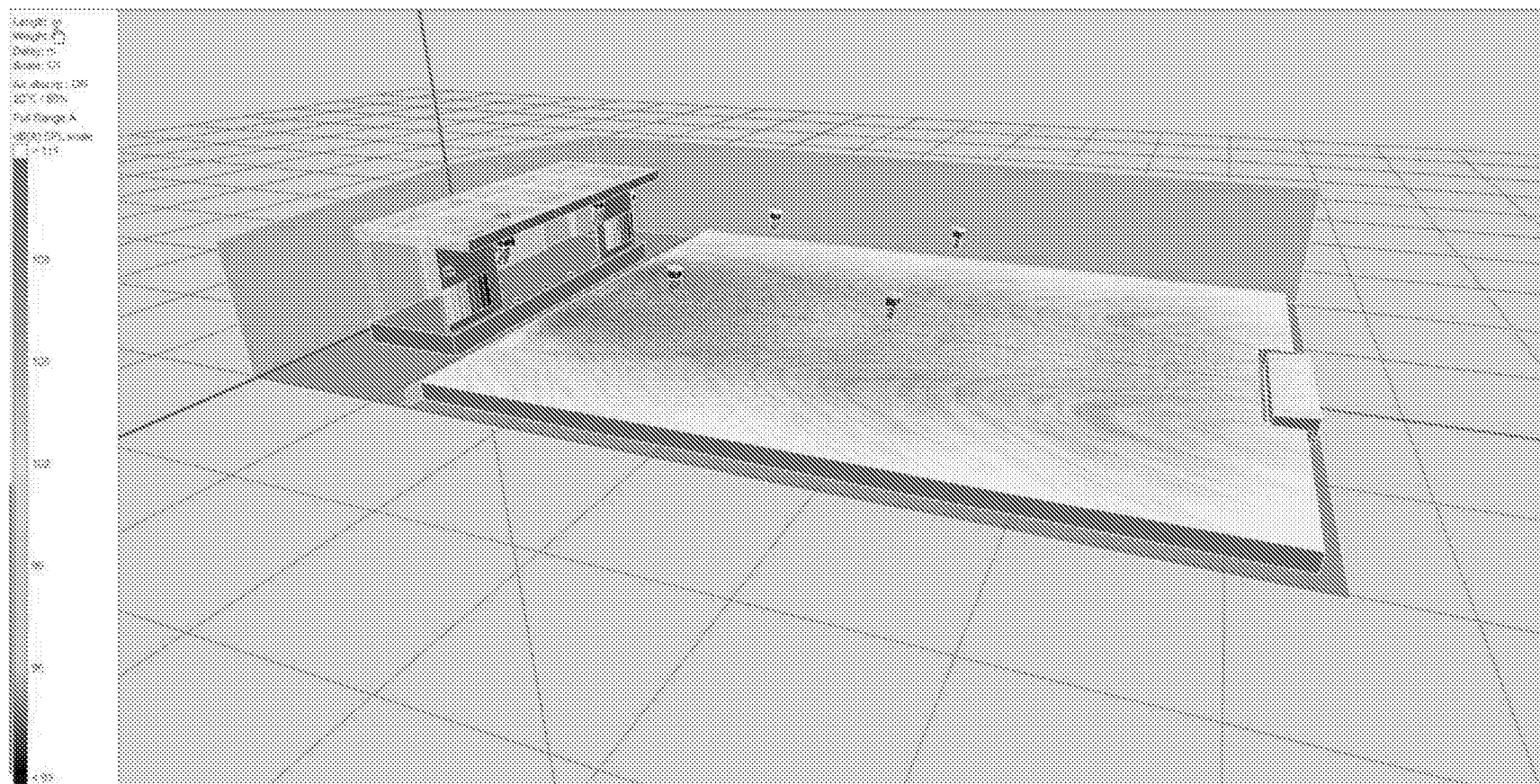
Prediction of MNL at 1m from West NSRs	63 Hz	125 Hz	A-w
Predicted max. MNL within Venue	112 dB L _{eq}	104 dB L _{eq}	100 dB L _{Aeq}
Predicted max. MNL via Walls at 160m from Venue, 18m height	54 dB L _{eq}	43 dB L _{eq}	35 dB L _{Aeq}
Predicted max. MNL via Roof at 160m from Venue, 18m height	56 dB L _{eq}	48 dB L _{eq}	49 dB L _{Aeq}
Predicted max. Total MNL at 160m from Venue, 18m height	57 dB L _{eq}	47 dB L _{eq}	49 dB L _{Aeq}

7.4 Appendix D – PA Design information reproduced from Star Group Live

Equipment Layout

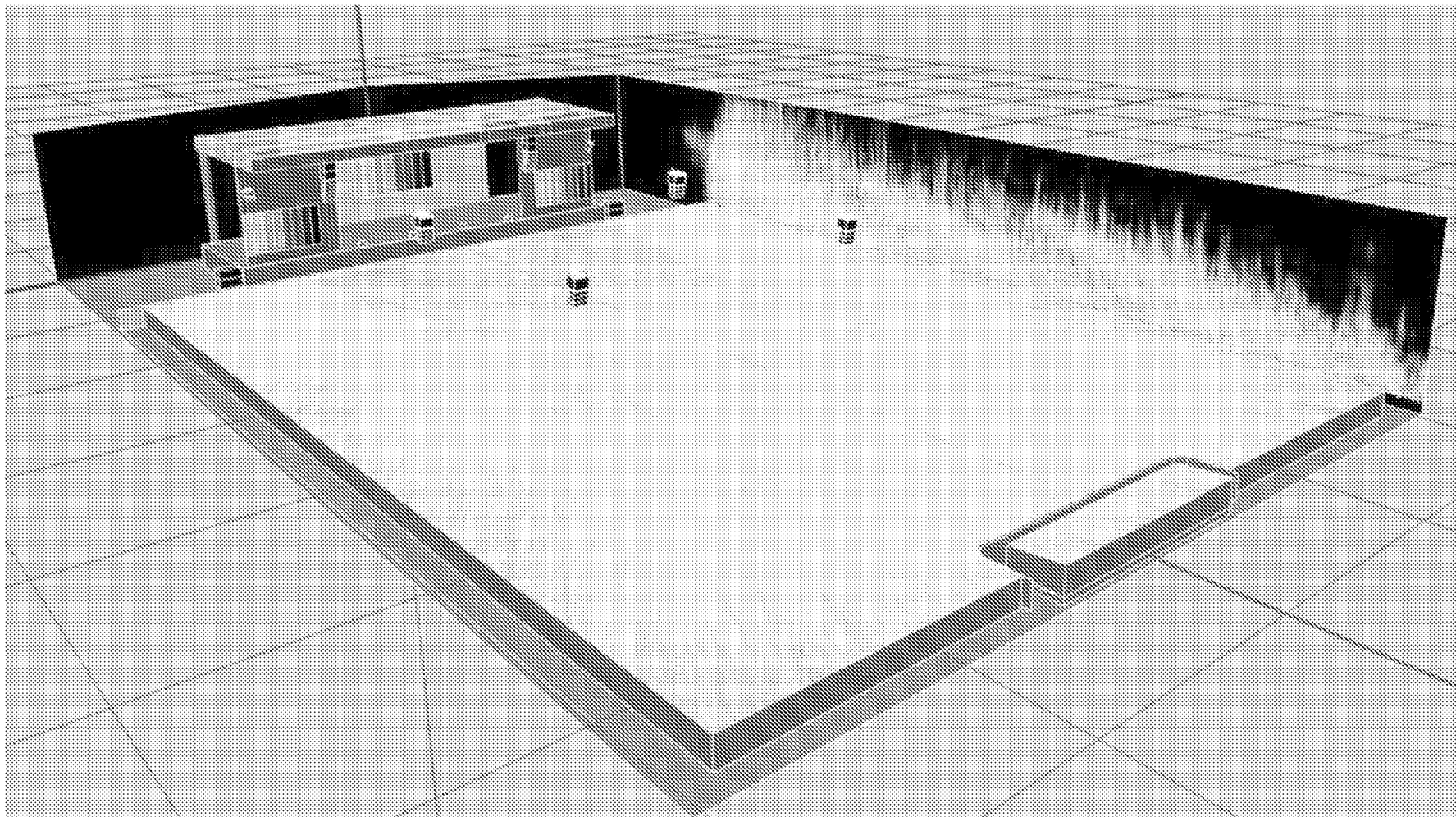


Modelled Contour of Sound Distribution Across Audience Plane



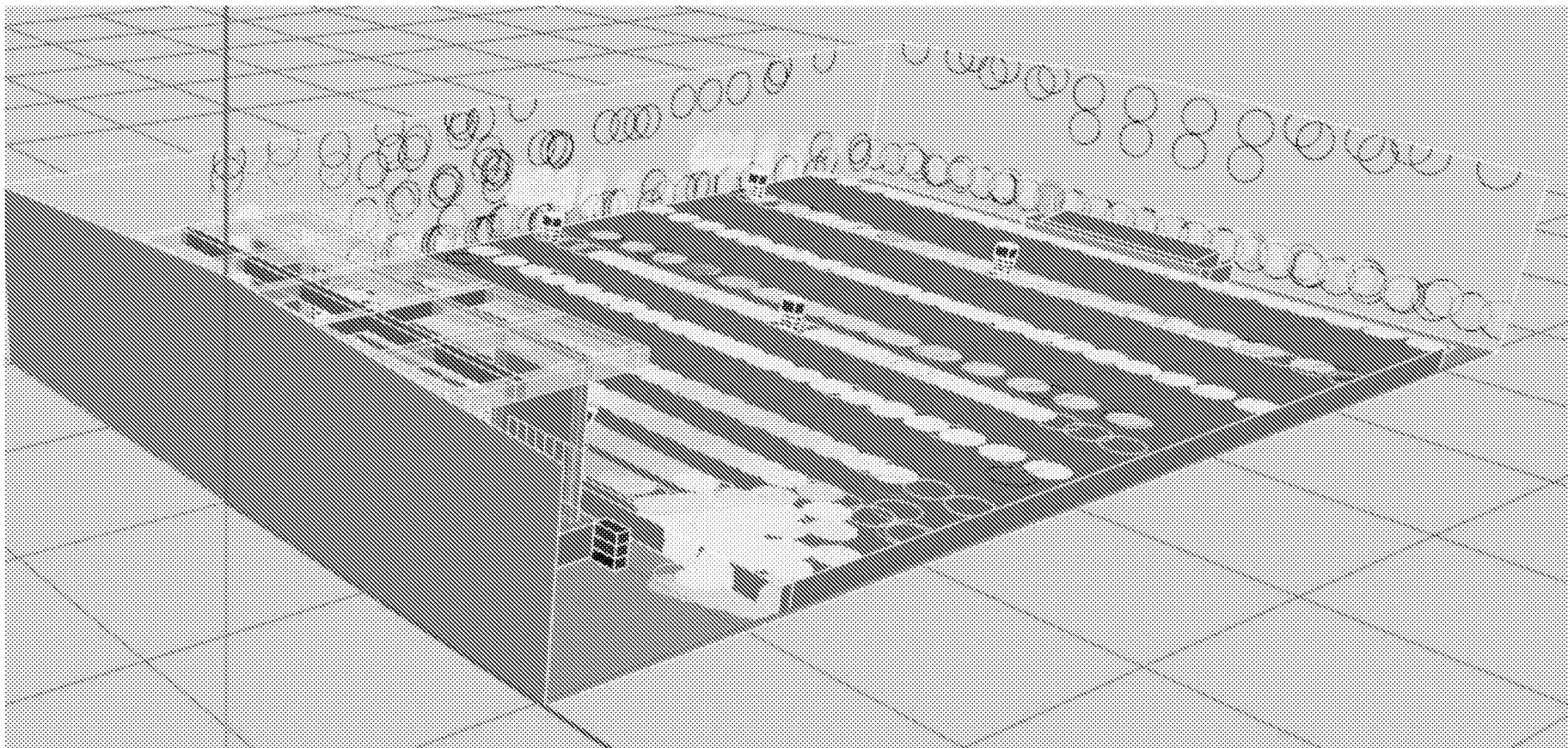
Note: The levels shown in the above image do not represent the absolute level of output expected from the PA system once the limiter has been calibrated. Rather this image is intended to show the relative levels, showing 4dB variation of sound pressure levels across the audience plane.

Modelled Contour of Vertical Sound Distribution



Note: The levels shown in the above image do not represent the absolute level of output expected from the PA system once the limiter has been calibrated. Rather this image is intended to show the relative levels, showing 10dB variation of sound pressure levels from the audience plan to roof level.

Modelled Contour of Sound Distribution Across Walls



Note: The levels shown in the above image do not represent the absolute level of output expected from the PA system once the limiter has been calibrated. Rather this image is intended to show the relative levels, showing the extent to which sound energy is directed away from the walls, particularly the glazed areas to the rear of the venue.

Technical note



BUSINESS > FLOOR STANDING

TOSHIBA Leading Innovation >>>



This system is particularly suitable to air condition large rooms like shops or showrooms or with low ceilings like restaurants or lofts.

Optimized air flow

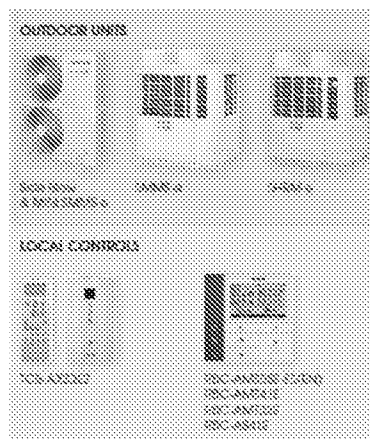
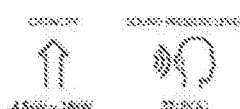
- The unit has been designed to have particularly high air flow rates, which correspond into superior air throw values.
- The wide and automatic vertical and horizontal air distribution angles, allow the air flow distribution to reach all areas, even when installed into large rooms.
- High air flow: from 180 l/s to 600 l/s (660 m³/h to 2160 m³/h).
- Wide air distribution angle: up to 150°.

Wide range

- Large capacity range: cooling capacities from 4.5 kW to 16 kW and heating capacities from 5 kW to 16 kW.

Installation everywhere

- The unit can be installed in the corner of the room; in this case the automatic swing angle can be fixed to deliver the air only where it is needed.
- Very small footprint: 0.128 m² up to 8 kW and 0.243 m² up to 16 kW.



FLOOR STANDING Performance		Cooling capacity (kW)							
Capacity class	Model	4.5	5.6	6.8	8.0	9.2	10.4	11.6	12.8
		4.5	5.6	6.8	8.0	9.2	10.4	11.6	12.8
Power consumption	W	200	240	280	320	360	400	440	480
Running current	A	0.9	1.1	1.3	1.5	1.7	1.9	2.1	2.3
Starting current	A	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6

FLOOR STANDING Physical data		Cooling capacity (kW)							
Capacity class	Model	4.5	5.6	6.8	8.0	9.2	10.4	11.6	12.8
		4.5	5.6	6.8	8.0	9.2	10.4	11.6	12.8
Air flow (l/s)	m³/h	660	825	990	1155	1320	1485	1650	1815
Air flow (m³/h)	m³/h	660	825	990	1155	1320	1485	1650	1815
Sound pressure level (dB(A))	dB(A)	27	28	29	30	31	32	33	34
Dimensions (mm)	mm	178x178x210	178x178x210	178x178x210	178x178x210	178x178x210	178x178x210	178x178x210	178x178x210
Weight	kg	4.5	5.6	6.8	8.0	9.2	10.4	11.6	12.8
Connection (mm)	mm	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Connection (mm)	mm	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Back panel distance	mm	20	20	20	20	20	20	20	20
Footprints	mm	200x200	200x200	200x200	200x200	200x200	200x200	200x200	200x200

For more information, please contact your Toshiba representative or visit our website: www.toshiba-europe.com

KwikHEAT MH300

Indirect fired Oil Site Heater



Description

The KwikHEAT MH300 is a highly fuel efficient indirect oil fired site heater providing a fast and effective solution to a wide range of applications requiring 100% flame heat heating. Due to thermostat controls, the unit can be left to run unattended for long periods of time

Typical applications

- Marquee's
- Factories
- Warehousing
- Storage Facilities
- Industrial buildings
- Supermarkets
- Events & Exhibitions
- Construction Sites
- Process Heating
- Food Processing

Unit Specification

Nominal Heating Capacity	1511kW / 500kW
Airflow	20860m ³ / hr @ 500Pa
Flame Level	6358W / @ 3m
Outlet Duct ID / Max length	630mm / 20.0m
Inlet Air	Fresh air via burner, optional air recirculation
Electrics	~115V 3P+N+E
Plug	BS4593 32 amp
Length / Width / Height / Weight	4050mm / 1200mm / 2350mm / 1450kg

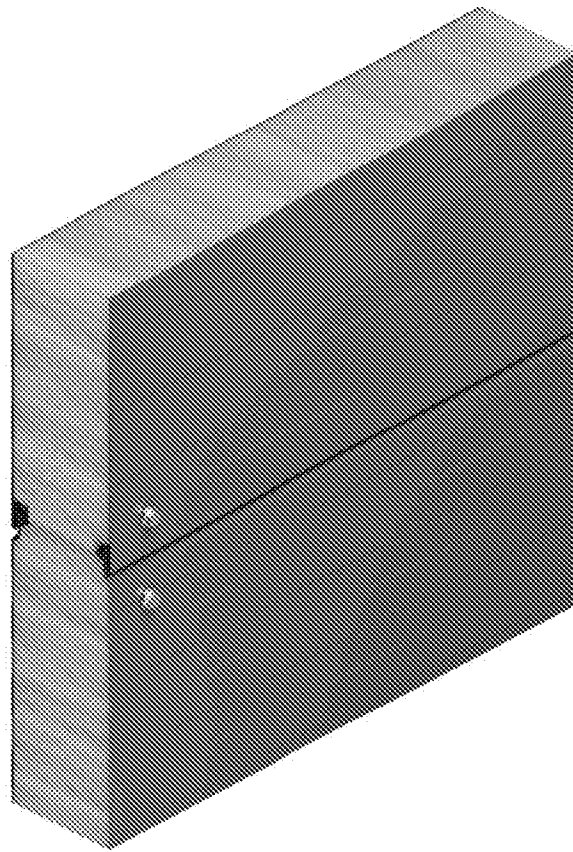
Insulated Panels
Sweden

Kingspan

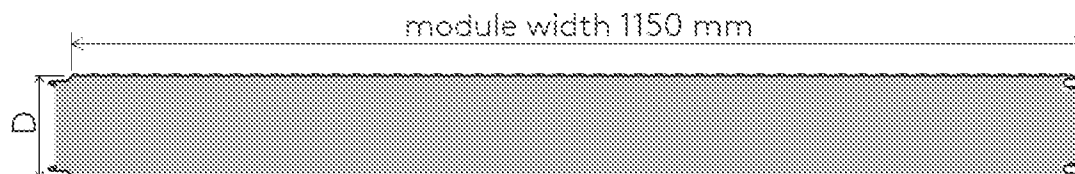
KS1150 RF C

Product Data Sheet

Wall panel with through-fix and K-Roc® stone wool insulation core.



Cross section



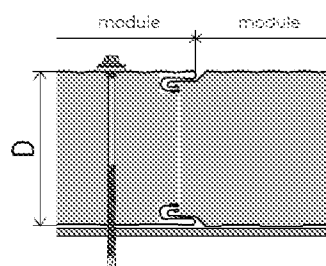
Application

The KS150 RF C is a through-fix wall system which can be fixed vertically or horizontally and it is suitable for wall cladding on all types of buildings except where there are internal low temperature conditions (below 0 °C).

Panel KS150 RF C available also in modules width 1000 and 1200 mm

The application of panel should be verified for each project individually in order to meet the design requirements.

Joint detail



Technical properties

Product	Module [mm]	Insulation core thickness D [mm]	Weight [kg/m²]	Panel lengths [m]		Number of panels in bundle [pcs]	Heat transfer coefficient $U_{a,c}$ [W/(m²K)] for $\lambda = 0,040$ at temp. 10°C	Sound insulation R_w [dB]	Fire parameters			
				Min. (1)	Max.				Reaction to fire	Fire resistance ¹⁾		
										H - horizontal	V - vertical	
KS150 RF C	1150 ²⁾	80	16,50	2,0	9,0	14	0,48	30	A2-s1,d0	-	EI 20 - 4,0 m EI 15 - 7,5 m	
		100	18,20		14,3	11	0,39			EI 60 - 7,5 m	EI 60 - 4,0 m EI 45 - 7,5 m	
		120	19,90			9	0,33					
		150	22,45			7	0,26					
		160	23,30			7	0,25			EI 180 - 4,0 m EI 120 - 7,5 m		
		175	24,57			6	0,22					
		200	26,70			5	0,20	29		EI 240 - 4,0 m EI 180 - 7,5 m		

Notes:

1) At the request of the ordering party (for an additional fee) it is possible to deliver shorter panels. In other cases short sections are combined in length, meeting the production requirements.

2) Panel available also in modules width 1000 mm and 1200 mm

3) Fire resistance parameters are valid for the product specification based on specific fire resistance classification of relevant product.

Profilation options

Profilations	Geometry - dimensions in [mm]	External	Internal
N (Micro)			
E (Euro)			
O (4mliner 22)			
F (Flat)			

standard
 on request

Material

- Exterior/Interior facings
 - Hot-dip zinc coated steel with a total of 275 g/m² of zinc, according to EN 14 509;
 - austenitic stainless steel type 1.4301 according to EN 10 088.
- Insulation core
 - K-Roc® stone wool core – Class A;

Exterior coating options

- Polyester (PE5) – for the environment category up to C3;
- PVDF – for the environment category up to C4;
- Plastizol (PVC) – for the environment category up to C4;
- Foodsafe (PVC) – for the environment category up to A3*;
- Spectrum (PUR) – for the environment category up to C5;



Interior coating options

- Polyester (PEI) – for the environment category up to C2;
- Foodsafe (PVC) – for the environment category up to C4**;
- PVDF – for the environment category up to C4;
- Spectrum (PUR) – for the environment category up to C5;



*Outer coating allowed only for partition walls of the building.

** For more details please contact with Kingspan.

Quality

Kingspan insulated sandwich panels are manufactured from the highest quality materials, using state of the art production equipment to rigorous quality control standards, complying with ISO 9001:2015 standards, ensuring long term reliability and service life. KS1150 RF C sandwich panels are manufactured in accordance with the EN 14 509 and CE marked.

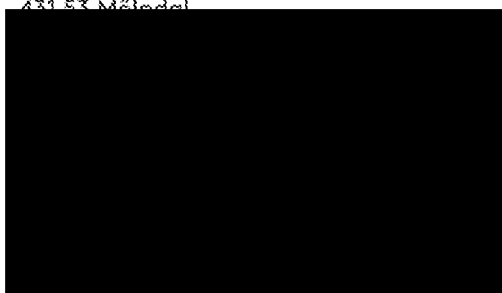
Guarantees & Warranties

The Kingspan guarantees are individually assessed for each project, especially depending on the aggressiveness of the environment and the type of surface treatment chosen.

KINGSPAN STANDARD COLORS - EXTERIOR SIDE			
Exterior coat types (for galvanized steel)	Polyester (PEG) ~ 25µm	RAL 9010	RAL 9002
			RAL 7033
		RAL 9005	RAL 9003
		Standard interior notes for KINGSPAN panels are RAL 9010 PEG or RAL 9002 PEG (dependent for the inside of the panel).	
	Spectrum (PUR) ~ 50µm	RAL 9010	
The colors are only illustrative in nature and may differ from the actual ones.			

Other colors from RAL and NCS palettes are also available on request after prior consultation with Kingspan.

Kingspan AB
Kråketorpsgatan 10 C
431 53 Mölndal



Although Kingspan has endeavored to provide information contained in this publication, users are advised as possible, correct any omissions, please note that its content should not be the basis of the procedure in any particular case. Any advice, opinions, information or other content is published solely based on the principle that neither the company, its employees or representatives, or anyone who contributed to the publication of this publication, should assume any liability for its content or any damages caused or suffered from its use.

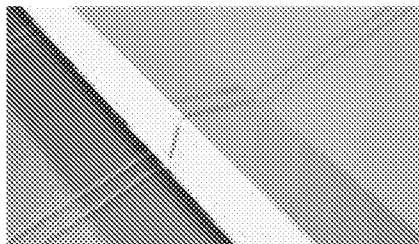
07/2020



Product Data

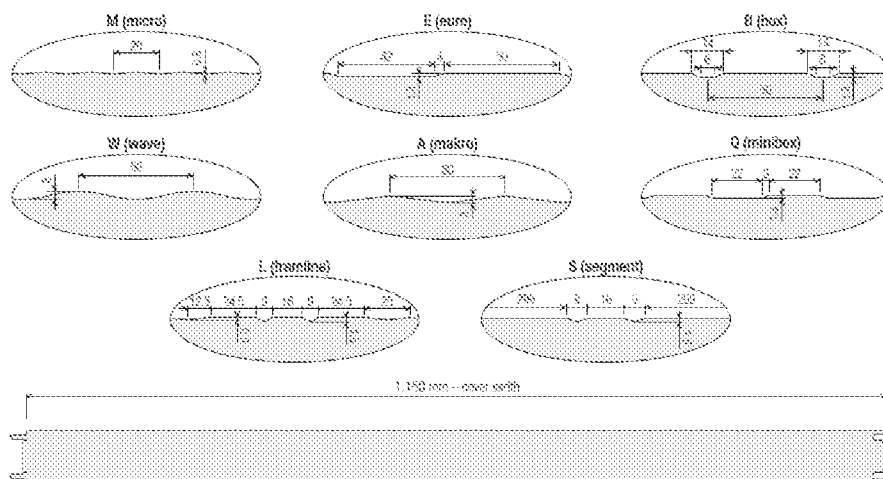
Application

The KS1150 TF is a through fixed wall system which can be laid vertically or horizontally and is suitable for wall claddings on all types of buildings.

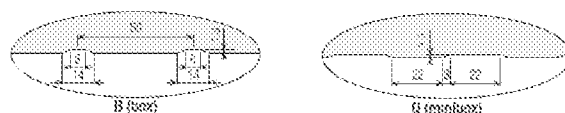


Dimensions & Weight

External Facing Profiles



Internal Facing Profiles



Panel Thickness (mm)	40	50	65	70	80	100	120	150	170	200
Weight (kg/m²)	11.70	12.15	12.84	13.10	13.70	14.45	15.45	16.70	17.70	19.00

Product Tolerances

All materials intended for production of composite panels are in compliance with national regulations and standards. Dimensional tolerances of Kingspan insulated panels correspond to EN 14509 annex D.

Panel length	
For panel length under 6 m	±4 mm
Panel length is equal or over 6 m and under 12 m	±6 mm
Panel length is equal or over 12 m	±8 mm
Panel width	±3 mm
Thickness	
Panel thickness d ≤ 50 mm	±2 mm
Panel thickness 50 mm < d < 100 mm	+3 mm -2 mm
Panel thickness d ≥ 100 mm	+3 mm -0 mm
Flatness of the cut end	± 0.6% of the panel width
Panel bow $(\Delta_1 + \Delta_2) / 2$	± 10 mm

4.2.5



Product Data

Available Lengths

The standard panel length is between 2 and 14.5 meters. Panels shorter than 2 m and longer than 14.5 m are available on request. Please contact your Kingspan sales partner.

Certification Reference

Kingspan possesses a wide range of insulated panel approvals (building, technical, thermal, static, fire, acoustic). In case you require further information, please contact Kingspan Technical department.

Steel

Galvanic protection options

1. Hot-dip zinc coated steel with a total of 275 g/m² of zinc, according to EN 10147:2000. This can be finished with a number of coatings – Polyester, Spectrum™, PVDF, Plastisol and Foodsafe finishes.
2. Galvalloy (hot-dip coated with eutectic alloy of approx. 95% Zn, 5% Al and other elements) in accordance with EN 10214 for 200 µm Plastisol coated steel.

Substrate thicknesses

- Standard external sheet thickness 0.80 mm.
- Standard internal sheet thickness 0.40 mm.
- Other thicknesses are available by arrangement with Kingspan.

External Coating Options

1. Standard Polyester – PES

Polyester is a universal, economic coating system suitable for exterior and interior applications. The nominal coating thickness is 25 µm.

2. PVDF

PVDF offers unequalled colour and gloss retention and good corrosion resistance. The nominal coating thickness is 25 µm. It can be used in climates with extremely high UV radiation combined with extreme temperatures and relative humidity. The standard colour range includes metallic silver.

3. Spectrum™

Kingspan Spectrum™ is a 60µm Polyurethane coated semi gloss finish with a slight granular effect. It offers an outstanding durability- and weather resistance performance, excellent corrosion and UV-resistance as well as high color & gloss retention characteristics.

Its superior flexibility enables high resistance against mechanical damages. Kingspan Spectrum is available in a wide range of solid and metallic colours.

Furthermore it is free of chlorine, phthalates and plasticizers and 100% recyclable.

4. Plastisol 200 µm

Plastisol is a high performance coating system with a grain finish and a nominal thickness of 200 µm. Typical properties of Plastisol are excellent abrasion, high corrosion resistance, excellent flexibility and therefore very good scratch resistance.

Internal Coating Options

1. Polyester

Polyester coating with a nominal thickness of 15 µm. The standard colour is grey white, (similar RAL 9002).

2. Foodsafe

The surface of this 150 µm thick polymer coating is non-toxic and resistant to mould, durable and easy to clean. It is chemically inert and safe for continuous contact with unpacked food. The standard colour is white. Consult Kingspan about the availability of other colours.

Other coating systems are available by discussion with Kingspan.

Plain and coloured aluminium is available on a project specific basis. Contact Kingspan Technical Services.

Insulation Core

Rigid PUR or Firesafe IPN closed-cell foam is the standard insulating core used.

It is made to a non-deleterious specification with Zero Ozone Depletion Potential ODP and is CFC/HCFC free

Seals

Factory Applied Side Joint Tape

All KS1150 TF panel side joints have factory applied anti-condensation seals fitted into the groove to automatically seal the joint between panels.

Product Data

Performance

Thermal Insulation according to EN ISO 10211-2

Panel Thickness (mm)	U (W/m ² K)	R (m ² K/W)
40	0.536	1.87
50	0.447	2.23
60	0.370	2.70
70	0.321	3.11
80	0.277	3.61
100	0.202	4.95
120	0.165	6.03
150	0.140	7.14
170	0.131	7.63
200	0.118	8.47

U – Thermal transmittance W/m²K
R – Thermal resistance of K/m²
λ – Long-term thermal conductivity W/mK

Biological

Kingspan insulated sandwich panels are immune to attack from mould, fungi, mildew and vermin. No urea formaldehyde is used in the construction, and the panels are nondeleterious.

Fire

KS1150 TF insulated sandwich panels have been tested and approved and comply with National Building Regulations and standards. Panels with FIREsafe IPN core are classified as B-s,d1, according to EN 13501-1.

Panel Thickness (mm)	Fire resistance according EN 13501-2
40	N/A
50	N/A
60	E 15 (etc.)-s1 EW15 (etc.)-s1
70	E 15 (etc.)-s1 EW30 (etc.)-s1 EW15 (etc.)-s1
80	E 15 (etc.)-s1 EW30 (etc.)-s1 EW15 (etc.)-s1
100	E 30 (etc.)-s1 EW30 (etc.)-s1
120	E 30 (etc.)-s1 EW30 (etc.)-s1
150	E 30 (etc.)-s1 EW30 (etc.)-s1
170	E 30 (etc.)-s1 EW30 (etc.)-s1
200	E 30 (etc.)-s1 EW30 (etc.)-s1

Acoustics

Panel Thickness (mm)	single figure weighted sound reduction R _w (dB)
40	27
50	27
60	27
70	27
80	27
100	26
120	26
150	26
170	26
200	26

Building Regulations

Kingspan KS1150 TF insulated sandwich panels apply to the European standard EN 14509: Self-supporting double skin metal faced insulating panels and conform to additional National Building Regulations and standards.

Quality

Kingspan insulated sandwich panels are manufactured from the highest quality materials, using state of the art production equipment to rigorous quality control standards, complying with ISO9001:2000 standards, ensuring long term reliability and service life.

Guarantees & Warranties

Kingspan will provide external coating, product guarantee on an individual project basis.

Packing

Standard packing – road transportation

KS1150 TF panels are stacked weather side to internal side. The top, bottom, sides and ends are protected with foam and timber packing and the entire pallet is wrapped in plastic.

The number of panels in each pack depends on panel thickness and length. The table below is shown as a guide. Quantities are reduced for exceptionally long panels. Typical pallet height is 1,100 mm.

Maximum pallet weight is 4,200 kg

Panel core thickness (mm)	40	50	60	70	80	100	120	150	170	200
Number of panels in package	25	25	25	25	25	10	8	7	6	5

Delivery

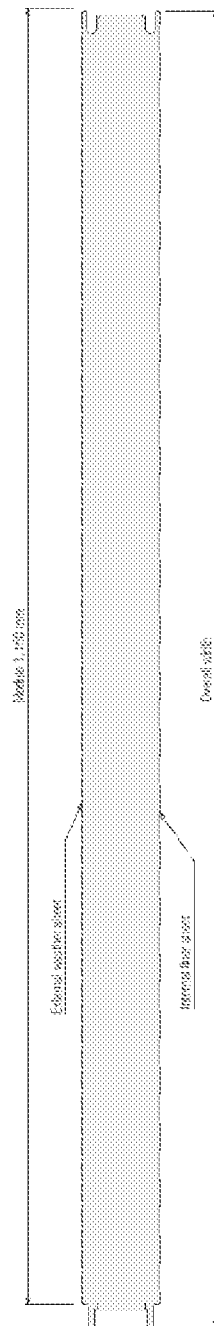
All deliveries (unless indicated otherwise) are by road transport to project site. Off loading is the responsibility of the client.

Site Installation

Site assembly instructions are available from Kingspan.

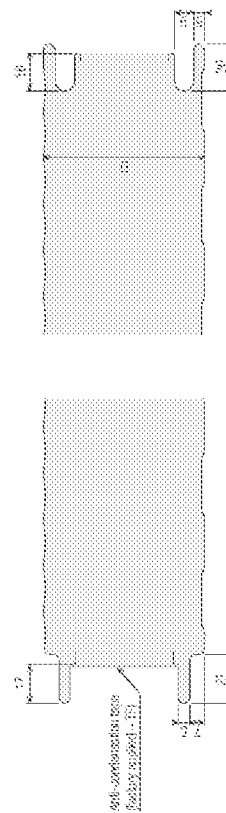
Kingspan will arrange training of the site fitters and supervisors if requested.

Panel Dimensions



Available Panel Thicknesses

Panel Thickness (mm)	Overall Panel Width (mm)
40	1,171
50	1,171
60	1,171
70	1,171
80	1,171
100	1,171
120	1,171
150	1,171
170	1,171
200	1,171



4.2.8