Aval Consulting Group.

Noise Impact Assessment

23 Windsor Street, Uxbridge, UB8 1AB

Client: Shahidul Monaf

May 2023

Aval Consulting Group.

Executive Summary

Aval Consulting Group has been commissioned by Shahidul Monaf to conduct a Noise Impact Assessment at 23 Windsor Street, Uxbridge, UB8 1AB.

The requirement of the planning conditions is to ensure that the noise emissions from the proposed takeaway do not have any adverse impact on any of the local receptors, specifically in order to investigate:

1. The proposed development fails to demonstrate that unacceptable levels of noise, disturbance and odour to surrounding residential occupiers, resulting from both the use and associated extract flues, would be appropriately mitigated and that sufficient refuse and recycling arrangements could be provided at the site, The proposed development would therefore harm the residential amenities of neighbouring occupiers and the general amenities of the area, contrary to Policies DMTC 4, DMHB 11 and DMEI 14 of the Hillingdon Local Plan - Part Two (2020) and Policy D14 of the London Plan (2021).

The report assesses the noise impact levels in Section 5 and provided appropriate mitigation measures in Section 6.

To ensure the residential amenity of nearby receptors and ensure there are no adverse impacts, it is proposed that:

a) The extractor fan should implement the mitigation measures defined in Section 6

It is concluded that following the implementation of the mitigation measures proposed, there will not be any adverse noise impacts from the proposed development.

Project Information

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Client	Shahidul Monaf
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Revision History

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Disclaimer

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1. Introduction

1.1 Overview

Aval Consulting Group Ltd has been commissioned to carry out a noise assessment at 23 Windsor Street, Uxbridge, UB8 1AB.

This report will investigate the noise levels from the proposed development which is a change of use from Class E to Hot Food Takeaway. The main purpose of this report is to carry out a noise survey to determine if the noise impact from the proposed changes is likely to have a detrimental impact on the nearby receptors. The requirement of the planning conditions is a noise impact assessment to ensure that the noise emissions from the extraction system do not have a significant impact on local receptors.

1.2 Site Location and Proposal Information

Figure 1.1 shows the proposed site location. The site is at the corner of and bounded by Windsor Street to the west and by Cross Street to the south. Windsor Street has numerous amounts of independent shops including cafes and restaurants.

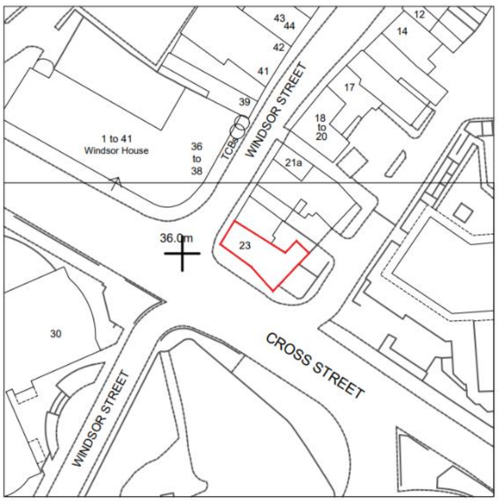
The proposal consists of the change of use Class E to a hot food takeaway. Further details and design plans of the proposed layouts can be found in Appendix B.

It is also understood that the hours of operation of the commercial unit would be daytime and night-time. The sources of noise that form part of the prevailing background levels of noise at the location of the proposed development have been identified as Traffic from Cross Street as well as traffic from Windsor Street and pedestrians on Windsor Street.

The NSR (nearest sensitive receptor to noise from the proposed development) has been determined as

- Residents on the upper floor of the purposed development

Figure 1-1 Proposed site location (Source: Client)



2. Relevant Noise Standards

This section summarises all legislation, policy, statutory and non-statutory guidelines relevant to the proposed development. Furthermore, the latest regional and local planning policy guidance specifically applicable to the proposed development has been reviewed.

2.1 The 'National Planning Policy Framework (NPPF)

The updated 2021 version of the 'National Planning Policy Framework (NPPF)'[1] contains information and general guidance to Local Authorities in relation to considering and taking into account noise. The National Planning Policy Framework (NPPF) guidance reinforces that noise should be taken into account considering planning policies and decisions. Some of the guidance contained in the 'National Planning Policy Framework (NPPF)' includes the following:

- Paragraph 174e: "…*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*…"
- Paragraph 185a,b: "*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should*:

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

  (b) *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;…*"
- Paragraph 187: *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.*

In conjunction with the 'National Planning Policy Framework (NPPF)', 'The Noise Policy Statement for England (NPSE)'[2], dated March 2010, states the following regarding a long-term vision of government noise policy:

"Noise Policy Statement for England Aims:

- *The first aim of the NPSE:*

  Avoid significant adverse impacts on health and quality of life from environmental, neighbour, and neighbourhood noise within the context of Government policy on sustainable development.
- *The second aim of the NPSE:*

  Mitigate and minimize adverse impacts on health and quality of life from environmental, neighbour, and neighbourhood noise within the context of Government policy on sustainable development.

[1] The National Planning Policy Framework (2018/19) https://www.gov.uk/guidance/national-planning-policy-framework
[2] Noise Policy Statement for England (NSPE) https://www.gov.uk/government/publications/noise-policy-statement-for-england

- *The third aim of the NPSE:*

  Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour, and neighbourhood noise within the context of Government policy on sustainable development."

In terms of the NPSE, the impact of noise can be categorised by the following terms:

- NOEL – No Observed Effect Level – The level where no effect can be detected
- LOAEL – Lowest Observed Adverse Effect Level – The level where adverse effects on health and quality of life can be detected
- SOAEL – Significant Observed Adverse Effect Level – The level where significant adverse effects on health and quality of life may occur.

The NPSE further states that:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors, and at different times."

No specific guidance is detailed or given in the 'National Planning Policy Framework (NPPF)', or 'The Noise Policy Statement for England (NPSE)' in terms of acceptable acoustic criteria/noise criteria in order to achieve the 'NOEL, LOAEL, or SOAEL'. Therefore, it is considered necessary to refer to alternate national guidance, preferably standardised or regulated such as an appropriate British Standard (BS), or in the absence of this, alternate World Health Organisation (WHO) guidelines, etc.

The British Standard 8223: Sound Insulation and Noise Reduction for Buildings/Code of Practice BS 8223: Sound Insulation and Noise Reduction for Buildings/Code of Practice states that for different spaces, there might be a range of noise levels that are considered acceptable.

2.2 WHO 'Guidelines for Community Noise'

Where noise is assessed against the 'Absolute Level', then this can be split into separate daytime and night-time legislation. The WHO 'Guidelines for Community Noise' state in 4.2.7 "Annoyance Responses" that:

"During the daytime, few people are seriously annoyed by activities with L_{Aeq} levels below 55 dB; or moderately annoyed with L_{Aeq} levels below 50dB. Sound pressure levels during the evening and night should be 5-10 dB lower than during the day…."

The guidance goes on to provide a daytime[3] internal acoustic criteria relative to critical health effect(s) that of 35 dB $L_{Aeq,16\ hour}$, and a night-time[4] level of 30 dB $L_{Aeq,8\ hour}$ / 45 dB L_{AFmax} linked with dwelling indoors. Therefore, assuming a maximum external noise level of 50 dB $L_{Aeq,t}$ during the daytime, (considering a 15 dB reduction in noise via a partially open window) an internal noise level of 35 dB $L_{Aeq,t}$ should be achieved.

During the night-time periods, a further publication; WHO Night Noise Guidelines For Europe' published in 2009 states that:

"Below the level of 30 dB $L_{night,outside}$, no effects on sleep are observed except for a slight increase in the frequency of body movements during sleep due to night noise. There is no sufficient evidence that the biological effects observed at the level below 40 dB $L_{night,outside}$ are harmful to health. However, adverse health effects are observed at the level above 40 dB $L_{night,outside}$, such as self-reported sleep disturbance, environmental insomnia, and increased use of somnifacient drugs and sedatives. Therefore, 40 dB $L_{night,outside}$ is equivalent to the LOAEL for night noise….. The LOAEL of night noise, 40 dB $L_{night,outside}$, can be considered a health-based limit value of the night noise guidelines (NNG) necessary to protect the public,

[3] daytime is typically between 07:00 h and 23:00 h.
[4] night-time is between 23:00 h and 07:00 h.

including most of the vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise."

Therefore, where absolute levels need to be referenced, a maximum daytime noise limit of 50 dB $L_{Aeq,t}$ can be considered, with the LOAEL for night of 40 dB $L_{night,outside}$ being considered.

2.3 IEMA (Institute of Environmental Management & Assessment)

IEMA also defines the sensitivity of receptors according to the table below

Very Substantial	Greater than 10 dB LAeq change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB LAeq change in sound level at a noise-sensitive receptor, or a 5 to 9.9 dB LAeq change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB LAeq change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB LAeq change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB LAeq change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB LAeq change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 2.1 Effect Descriptors (Guidelines For Environmental Noise Assessment, 2014)

2.4 The British Standard 8223: Sound Insulation and Noise Reduction for Buildings/Code of Practice

BS 8223: Sound Insulation and Noise Reduction for Buildings/Code of Practice provides acceptable noise levels. Table 4 of British Standard BS 8223 reproduced below (Table 2.1) provides appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

Activity	Location	07:00 to 23:00 (Day Time)	23:00 to 07:00 (Night Time)
Resting	Living Room	35 dB $L_{Aeq,\ 16\ hour}$	-
Dinning	Dining Room/area	40 dB $L_{Aeq,\ 16\ hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,\ 16\ hour}$	30 dB $L_{Aeq,\ 8\ hour}$

Table 2.2: British Standard recommended indoor noise levels for dwellings (Source: British Standard BS: 8223)

In addition, the WHO Guidelines 1999 recommends that to avoid sleep disturbance, indoor night-time guideline noise values of 30 dB L_{Aeq} for continuous noise and 45 dB L_{AFmax} for individual noise events should be applicable. It is to be noted that the WHO Night Noise Guidelines for Europe 2009 makes reference to research that indicates sleep disturbance from noise events at indoor levels as low as 42 dB L_{AFmax}. The number of individual noise events should also be taken into account and the WHO guidelines suggest that indoor noise levels from such events should not exceed approximately 45 dB L_{AFmax} more than 10 – 15 times per night. The WHO document recommends that steady, continuous noise levels should not exceed 55 dB L_{Aeq} on balconies, terraces, and outdoor living areas. It goes on to state that to protect the majority of individuals from moderate annoyance, external noise levels should not exceed 50 dB L_{Aeq}.

BS 8223 also states that the ambient noise levels in non-domestic buildings should not normally exceed the design ranges in the table below.

Activity	Location	Design Range dB $L_{Aeq,T}$
Speech or telephone communications	Department store, Cafeteria, canteen, Kitchen	50-55
	Concourse Corridor, circulation space	45-55
Study and work requiring concentration	Library, gallery, museum	40-50
	Staff/meeting room, training room	35-45
	Executive office	35-40
Listening	Place of worship, counselling, meditation, relaxation	30-35

Table 2.2: Typical Noise levels in non-Domestic Buildings (Source: British Standard BS: 8223)

2.5 BS 4142: 2014+A1:2019; Methods for rating and assessing industrial and commercial sound

In terms of industrial/commercial development, guidance is set out in BS 4142: 2014+A1:2019, 'Methods for rating and assessing industrial and commercial sound'. BS 4142 requires the noise from the process/equipment (in LA_{eq}) to be compared with the background sound level (LA_{90}) in conjunction with the new noise source.

BS 4142 states that if the rated noise level exceeds the LA_{90} background sound level by around +10 dB or more, then it is likely that the resultant noise may have a significant adverse impact, a difference of around +5 dB over the background sound level is likely to have an adverse impact, and where the rating level does not exceed the background sound level it is an indication that the resultant noise is likely to have a low adverse impact.

BS 4142: 2014 provides a method for assessing whether an industrial or commercial sound source (e.g. fixed mechanical plant) is likely to cause a disturbance to persons living near to the sound source.

The 2014 document introduces three main acoustic features:

- **Tonality:** Defined as more sound in the 1/3 octave band than those nearby 1/3 octave bands or more sound in a given frequency than in those nearby frequencies. The tonality feature correction +6dB and can be applied using subjective method or an objective method using 1/3 octave bands.
- **Impulsivity:** defined as sound that increases by a rate of at least 10dB per second, regardless of its duration. The impulsivity feature correction range from 0-9 dB and can be applied using a subjective method or an objective method using a sound level meter capable of sampling sound at either once every 0.01s interval or once every 0.025s interval.
- **Intermittency:** Defined as sound that can be identified as being on/off during the measurement period in which case the correction factor that is applied to the specific sound source (e.g. fume extraction system) is +3 DB.

BS 4142 assesses potential significant effect by comparing the source noise (extractor duct vent noise) with the measured background noise level (LA90). The standard provides a penalty (correction factor) for acoustic features for instance bangs or tonal qualities that can increase the likelihood of noise complaints and in these cases, the standard requires a correction to be added to the source noise level. The source noise level along with the correction factor is referred to as the 'rating level'. The rating level is then compared with the background level (La90). BS 4142:2014 advocates the use of LAeq,T - a level, which is directly measurable and termed the Specific Sound Level.

- Subjectively the Specific Sound Level may be corrected as follows:

The Specific Sound Level is subject to a correction for tonality between 0dB to +6dB for sound ranging from not tonal to prominently tonal. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6dB where it is highly perceptible.

The Specific Sound Level may be also corrected to impulsivity. A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of +3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible.

Other sound characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, can have a penalty of 3dB applied.

Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

Further corrections may be applied due to intermittency. When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

If the subjective method is not sufficient for assessing the audibility of tones in sound or the prominence of impulsive sounds, BS4142:2014 suggests using the one-third octave method and/or the reference methods, as appropriate.

The one-third octave method tests for the presence of a prominent, discrete-frequency spectral component (tone) typically compares the $L_{Zeq,T}$ sound pressure level averaged over the time when the tone is present in a one-third-octave band with the time-average linear sound pressure levels in the adjacent one-third-octave bands. For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference. The level differences between adjacent one-third-octave bands that identify a tone are:

• 15 dB in the low-frequency one-third-octave bands (25Hz to 125Hz);

• 8 dB in the middle-frequency one-third-octave bands (160Hz to 400Hz); and

• 5 dB in the high-frequency one-third-octave bands (500Hz to 10,000Hz).

- The reference (objective) method.

If the presence of audible tones is in dispute, a special measurement procedure can be used to verify their presence. Based on the prominence of the tones this procedure also provides recommended level adjustments. The aim of the reference method is to assess the prominence of tones in the same way as listeners do on average. The method is based on the psychoacoustic concept of critical bands, which are defined so that sound outside a critical band does not contribute significantly to the audibility of tones inside that critical band. The method includes procedures for steady and varying tones, narrow-band sound and low-frequency tones, and the result is a graduated 0dB to 6dB adjustment. It is known as the Joint Nordic Method 2 and is to be found in ISO 1996-2. The reference method is also described in BS4142:2014.

Specific Sound Level with (or without) added contentions is termed the Rating Level. When used to assess industrial or commercial sound, the Rating Level is determined and the LA90 background level is subtracted from it. Typically, the greater this difference, the greater the magnitude of the impact.

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

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

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.

In addition to above, based on the Guidance of Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018), there are two fundamental categories of noise source are of relevance. The first is the noise produced by the fan, which is a function of the type of fan (axial, centrifugal, mixed flow, etc), the rate of the airflow and the pressure drop. For these calculations, the octave band sound power from the fan is required. This can normally be obtained from the manufacturer.

The second category of noise is generated by turbulence as the air passes within the ducts or through the exit grille or louvre. In this case, the amount of noise is determined by the design of duct, grille, or louvre, the pressure drop across terminations, the velocity of the air (this can be variable across the duct, grille, or louvre) and the area of the duct or opening. The problem with this form of noise, especially at terminations, is that in most situations it can only be controlled at its source. For example, at the feature that is generating the noise as there is no further length of duct in which to install noise control equipment.

In some situations, a third source may need to be considered. This is where noise generated within the building breaks into the ductwork and is radiated from the outlet. The area of the duct walls, the acoustic properties of the duct walls, and the area of any inlets determine the amount of break-in noise. Once this noise has broken into the ducts it can be treated as if it were an additional component of the fan noise. However, the nature of this additional noise is such that it usually contains a relatively high level of low-frequency sound which can be difficult to attenuate.

The attenuation of fan noise (and break-in noise) provided by the ductwork is determined by the length of the ducts, the presence of any bends, changes in cross-section, the presence of any plenum chambers and termination effects (including sound-attenuating louvres if present and the attenuation provided by any change in cross-section). A balance has to be struck between the acoustic benefit of bends and louvres etc and the pressure drop that these create, possibly requiring a larger fan.

The sound energy components arising from fan noise, turbulence within the duct and at outlets, and from noise break-in, combine to produce an acoustic source at the outlet. The energy will then propagate away from the outlet in a manner determined by the nature and geometry of surrounding buildings and terrain. The nature, temporal characteristic and level of the resultant sound that reaches the ears of people in the vicinity (usually quantified by considering the noise at façades), and its level relative to the background noise, all contribute to its potential to cause disturbance and complaint. These factors should be taken into account at the planning stage as a matter of course. They form the basis of BS 4142 “Rating industrial noise affecting mixed residential and industrial areas” which is also used by Local Authority as support to the issue of a Noise Abatement Notice under the Environmental Protection Act.

2.6 Noise at Work 2005

For new premises or premises covered by planning conditions restricting the impact of noise the system shall be designed to prevent an acoustic impact on the external environment and therefore harm to the amenity, as well as ensuring that noise exposure of kitchen staff does not constitute an occupational noise problem (see Control of Noise at Work Regulations 2005).

The lower exposure action values are

(a) a daily or weekly personal noise exposure of 80 dB (A-weighted); and

(b) a peak sound pressure of 135 dB (C-weighted).

The upper exposure action values are

(a) a daily or weekly personal noise exposure of 85 dB (A-weighted); and

(b) a peak sound pressure of 137 dB (C-weighted).

The exposure limit values are

(a) a daily or weekly personal noise exposure of 87 dB (A-weighted); and

(b) a peak sound pressure of 140 dB (C-weighted).

Where the exposure of an employee to noise varies markedly from day to day, an employer may use weekly personal noise exposure in place of daily personal noise exposure for the purpose of compliance with these Regulations.

3. Noise Survey

3.1 Overview

This section provides the details of the methodological approach taken to assess the prevailing acoustic environment at the site where existing noise-sensitive receptors will be present. Establishing the current acoustic environment requires the monitoring of noise levels at the site and where applicable establishes the key noise indicators namely L_{AeqT}, $L_{A10T,}$ $L_{A90,T,}$ and $L_{Amax,T}$ as described in Appendix A.

3.2 Noise Monitoring Locations

The prevailing noise levels for the specific site were monitored at the locations shown in Figure 3.1 below. Location 1 was considered strategic to provide an accurate representation of prevailing conditions that are likely to be experienced at the rear of the site where the extraction flue is purposed. All noise measurements were carried out according to BS7445 (Parts 1&2). The measured values have been deemed as being in free-field conditions, henceforth appropriate corrections have been applied (also refer to section 4 of this report).

Figure 3.1 Location of Noise Monitoring (Picture Sourced from Google Maps)

Figure 3.2 Noise monitoring location picture

3.3 Noise Survey Periods

Noise monitoring was carried out for a period of 24 hours at each location and prevailing noise levels were recorded at 1min intervals. Details of the survey periods have been tabulated below.

Table 3.2 Noise Survey Periods

Measurement Location	Start Date	Start Time	End Date	End Time
1st Floor external amenity space	3/5/23	13:25	4/5/23	13:25

3.4 Details of Noise Monitoring Equipment

The details of the equipment used for noise monitoring are traceable laboratory calibrated. The class 1 sound level meters are calibrated within the last 2 years and the calibrator was calibrated within the 1 year. Please note that all equipment are class 1 monitors and are calibrated before and after surveys and drift is recorded.

3.5 Weather Conditions and observations

The following climate conditions were recorded for the site:

Wind: Less than 5 m/s. Direction at the start was southern and turned to west at approximately lunchtime on the 4th May.

Humidity: The weather was clear.

Temperature: 5 - 18 Degrees C.

Precipitation: None

The above weather conditions are suitable for the measurement of environmental noise in accordance with BS7445: Description and Measurement of Environmental Noise.

4. Noise Survey Results

4.1 Prevailing noise levels

The results of the noise monitoring (also see Section 3) have been summarised below.

Table 4.1 Summary of Noise Monitoring results (3dB correction applied)

	Noise Indicator	Daytime (07:00 to 23:00)	Night-Time (23:00 to 07:00)
Location 1 All values are in dB(A)	L_{Aeq}	**54**	**49**
	L_{A10}	**55**	**50**
	L_{A90}	**47**	**36**
	L_{Amax}	**93**	**78**

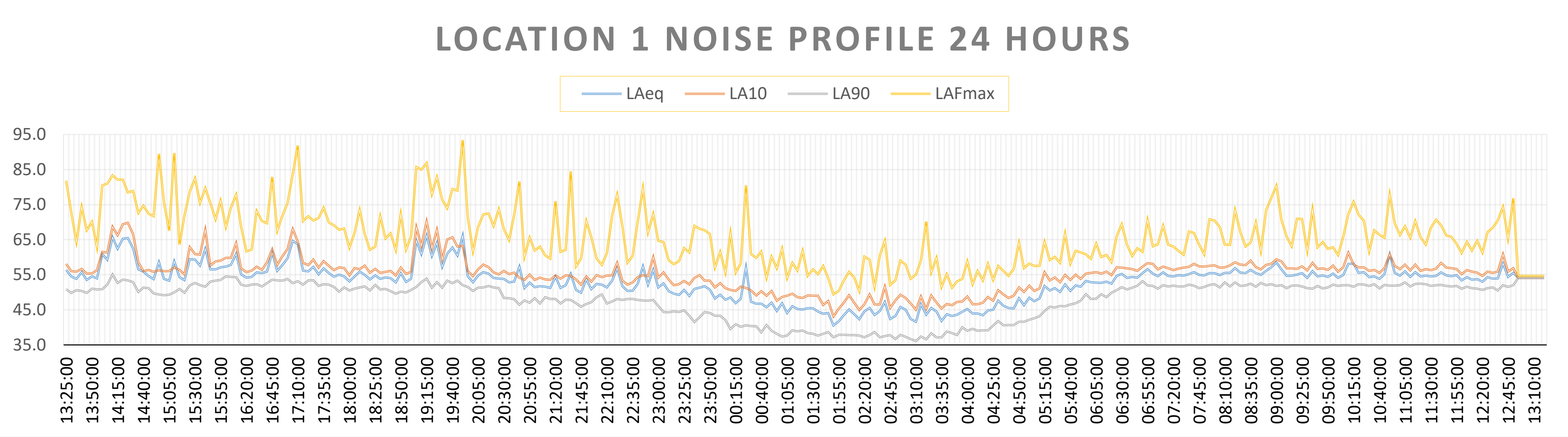
4.2 Noise Levels from the proposed Extractor Fan

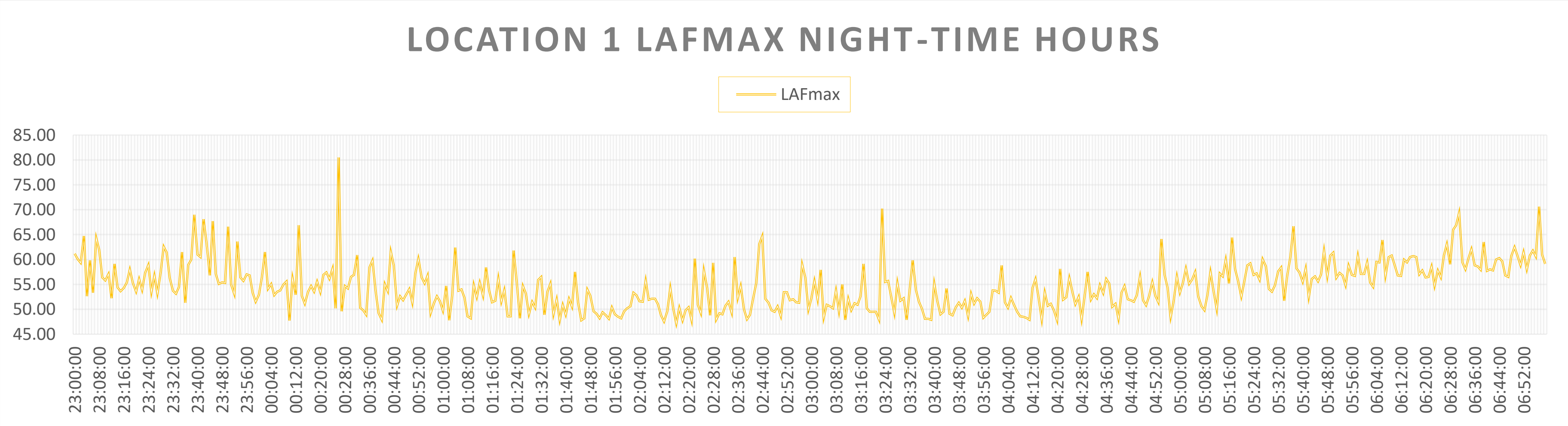
The proposed extractor fan is an S&P CBM-RE Series CBM-10/10 245W 600x600mm. The noise emission levels have been retrieved from the manufacturer. The proposed extractor fan will be installed within the storage room of the purposed development. The noise emission levels have been evaluated as 64dB at a distance of 1.5m from the manufacturer's specification and the results have been presented below. A 3dB penalty has been applied to consider possible tonal characteristics as per BS4142.

Table 4.3 Noise emission levels of CBM-10/10 245W extractor fan

Sound Pressure Level (dB(A)) at 1.5m	67

Figure 4.1 Noise Graphs (no correction applied)





5. Noise Impact Assessment

5.1 Noise Impact from Extractor Fan

The nearest sensitive receptor (in relation to the extractor fan) has been considered to be the residential unit on the first floor which is located at approximately 4m. Based on the noise emission levels, the frequency bands have not been provided by the manufacturer therefore a BS4142 penalty of 4dB has been imposed for tonality. It should be noted that the purposed extractor fan will be installed in the storage room of the purposed development, hence the noise transmission will be through the flue. The noise impact levels at the NSR have been evaluated and the noise reduction required has been determined by comparing the noise impact levels to the prevailing background levels at the rear ($L_{A90,daytime}$ = 47dB and $L_{A90,nighttime}$ = 36dB). The source was assumed to have a semi-spherical propagation due to the mounting on the storage room wall.

Sound pressure level of CBM-10/10 245W at 4m = 67 – 20log(4/1.5) = 58dB. When comparing with the $L_{A90,daytime}$ it is found that the a minimum noise reduction of 11dB is required and for $L_{A90,night\text{-}time}$ it is found that a minimum noise reduction of 22dB is required.

6. Mitigation

6.1 Extractor Fan

To ensure the residential amenity of the NSR it is proposed that a minimum acoustic reduction of 11dB for daytime and 22dB for night-time should be implemented as part of the design by the extractor fan. This can be achieved through the use of acoustic silencers or by having a vented acoustic enclosure/ louvre as part of the design. It will be ensured that the design and installation of the acoustic enclosures will be carried out by qualified personnel who will ensure the desired noise reduction values are met.

It is proposed that the selected mitigation measures can be secured as part of a post-planning condition.

7. Conclusions

This report provides an assessment of the potential noise impact in regard to the proposed development at 23 Windsor Street, Uxbridge, UB8 1AB.

Noise Surveys were undertaken to determine prevailing noise levels on-site and a noise impact assessment was made to determine how external noise from the proposed development would affect nearby residential amenities.

Based on the results presented in section 5 of this report, appropriate mitigation measures have been proposed.

It can be concluded that following the implementation of the proposed mitigation measures, the proposed development will not conflict with any national, regional, or local planning policy in relation to operational phase noise impact on existing receptors.

Appendix A: Noise Indicators

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Reference Time Interval, T

The specified time interval over which an equivalent continuous A-weighted sound pressure level is determined.

$L_{Aeq,T}$

The A-weighted equivalent continuous sound level. This is the sound level of a notionally steady sound having the same energy as the fluctuating sound over a specified measurement period, T.

$L_{A10,T}$

The A-weighted sound level exceeded for 10% of the specified measurement period, T.

L_{Amax}

The highest short duration A-weighted sound level recorded during a noise event.

L_{A90}

The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 % of a given time interval, T.

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible

3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

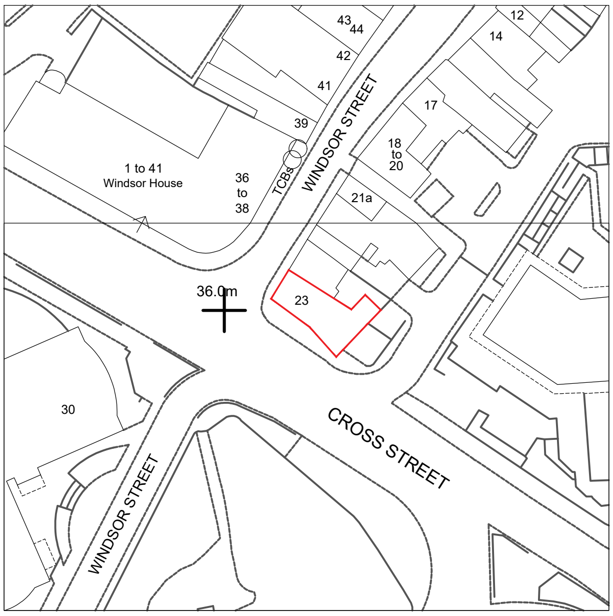
Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

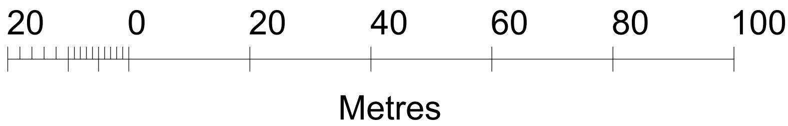
Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

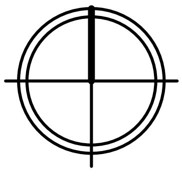
Appendix B: Site Drawings

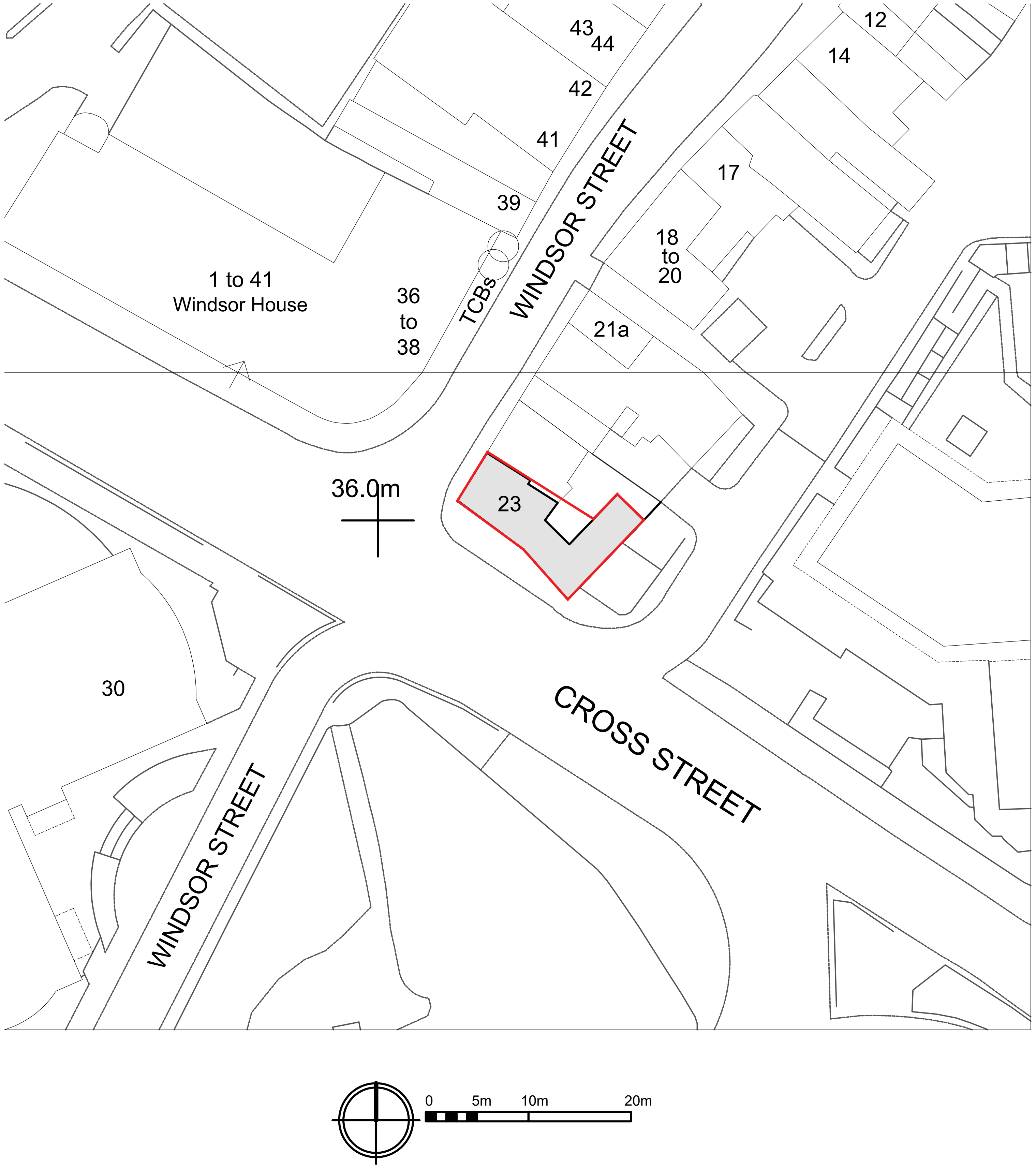


SCALE : 1/1250 @ A4

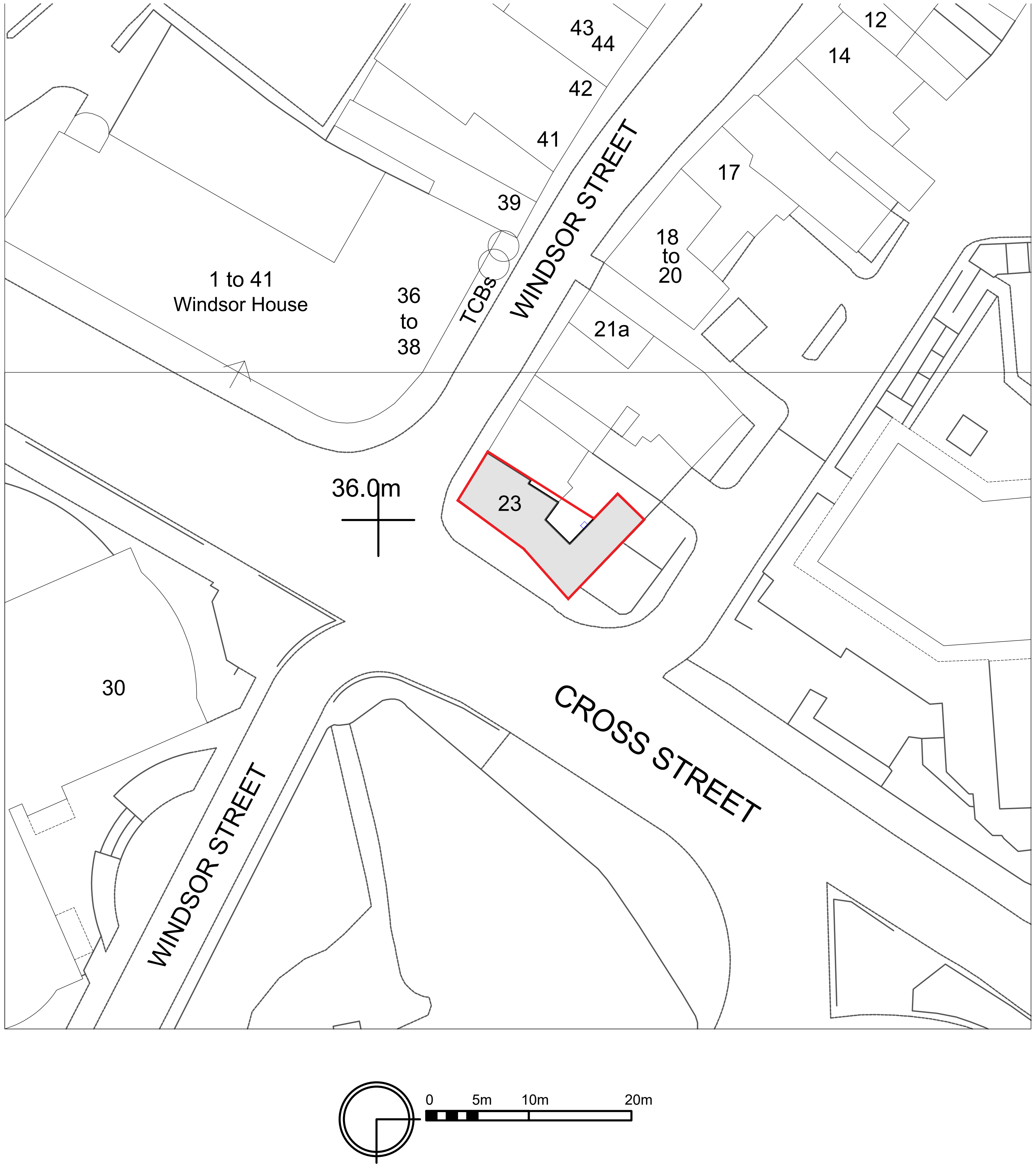


23 WINDSOR STREET, UXBRIDGE, UB8 1AB



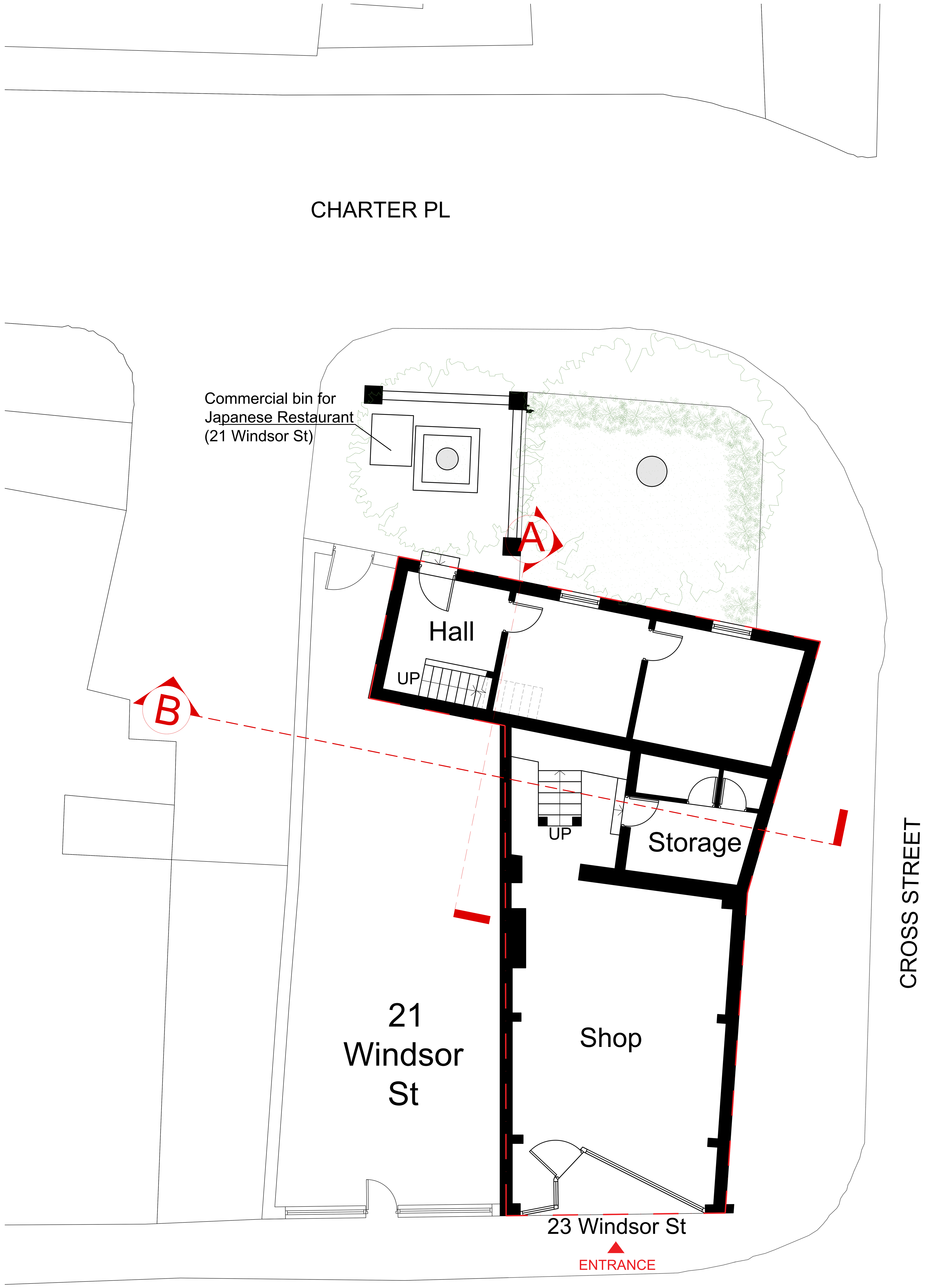


EXISTING SITE PLAN

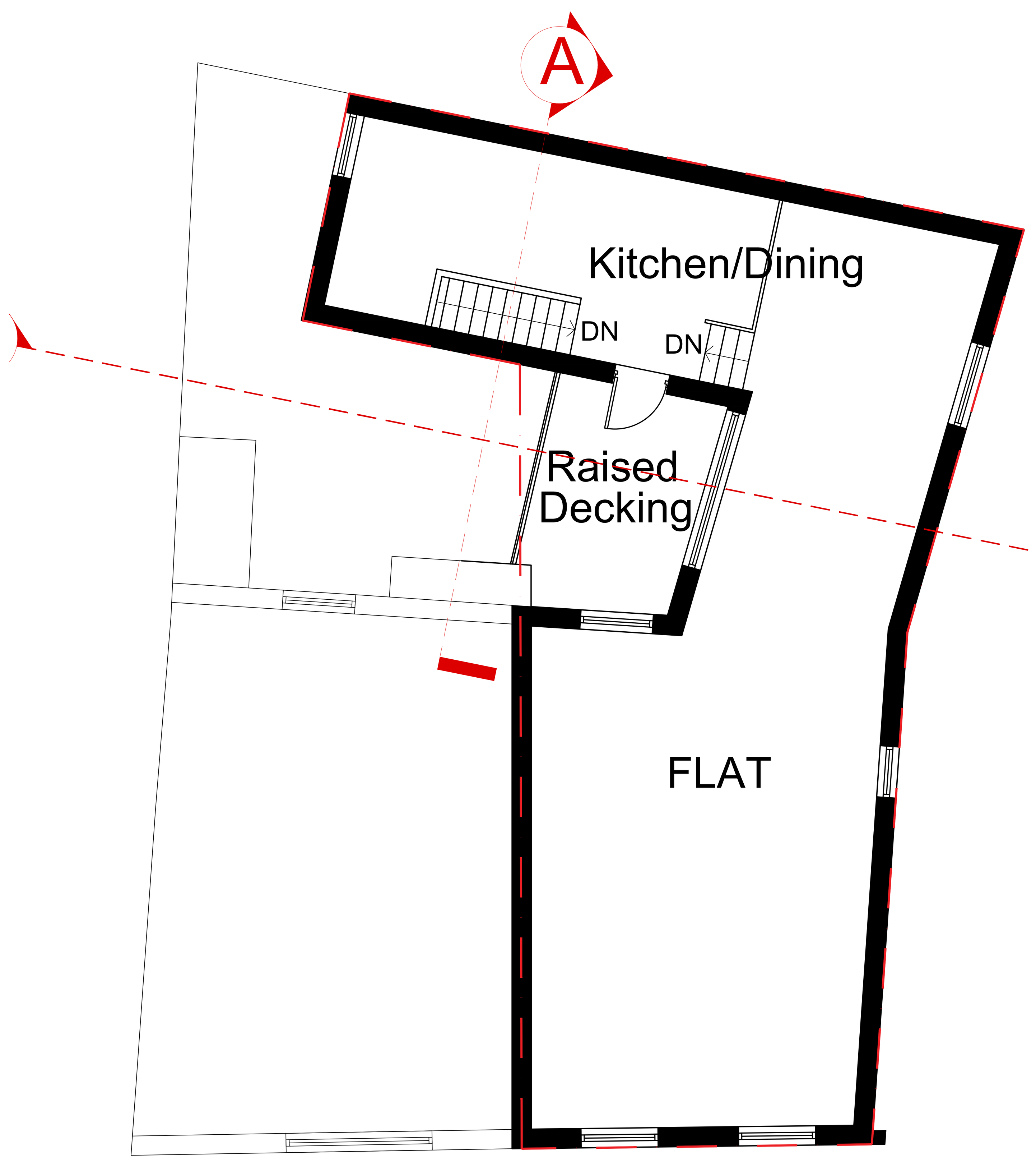


PROPOSED SITE PLAN

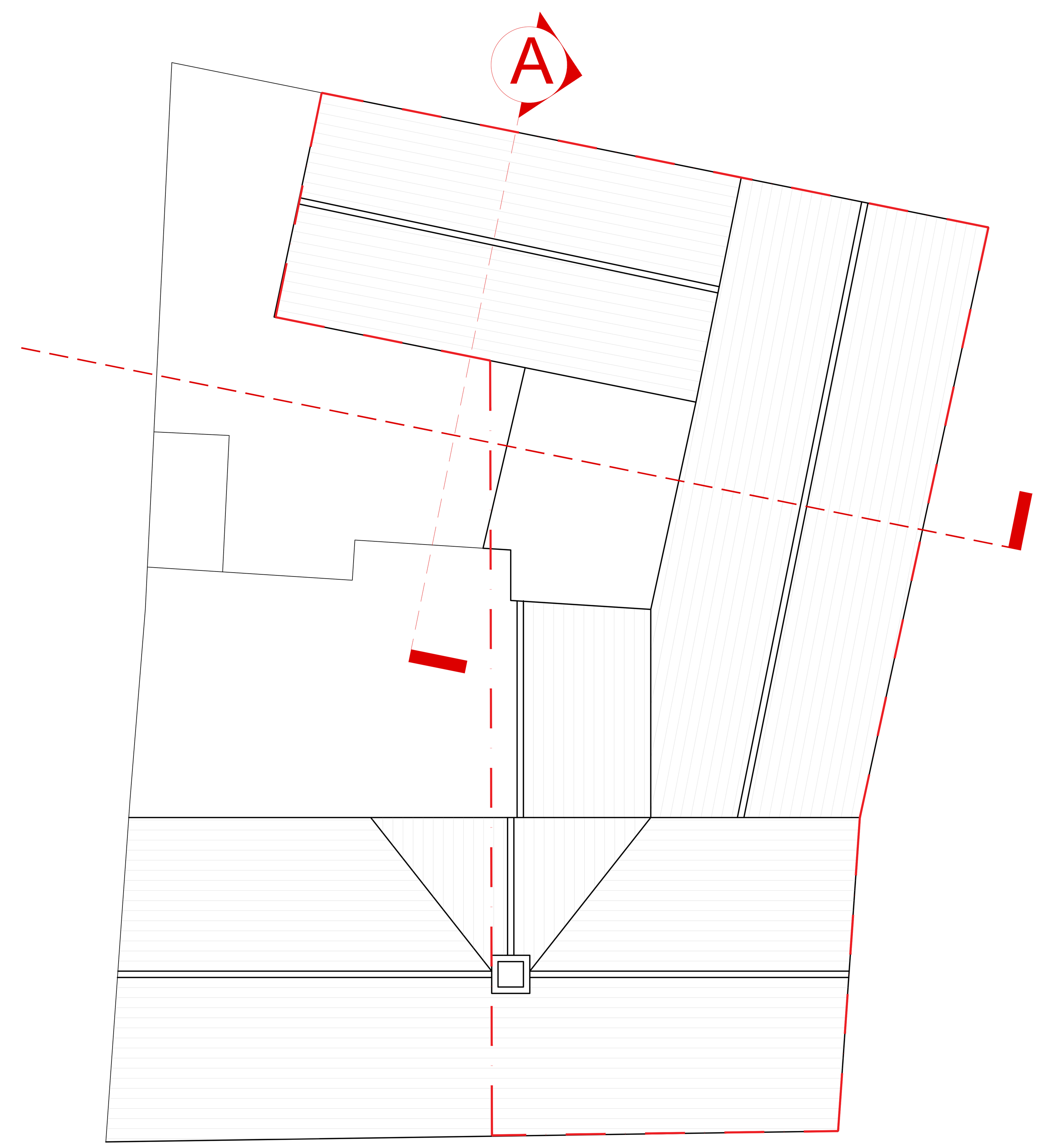
PROJECT	DWG NO.	SCALE	DETAIL	28.03.2022	PROJECT NO.	PR Architecture ltd.
23 WINDSOR STREET, UXBRIDGE, UB8 1AB	01	1:500 @ A2	SITE PLANS	ISSUED FOR DISCUSSION	23.10	Chartered Architect
PLANNING						120, Pinner Road, Harrow, HA1 4JD. Tel: 0208 357 2304



EXISTING GROUND FLOOR PLAN

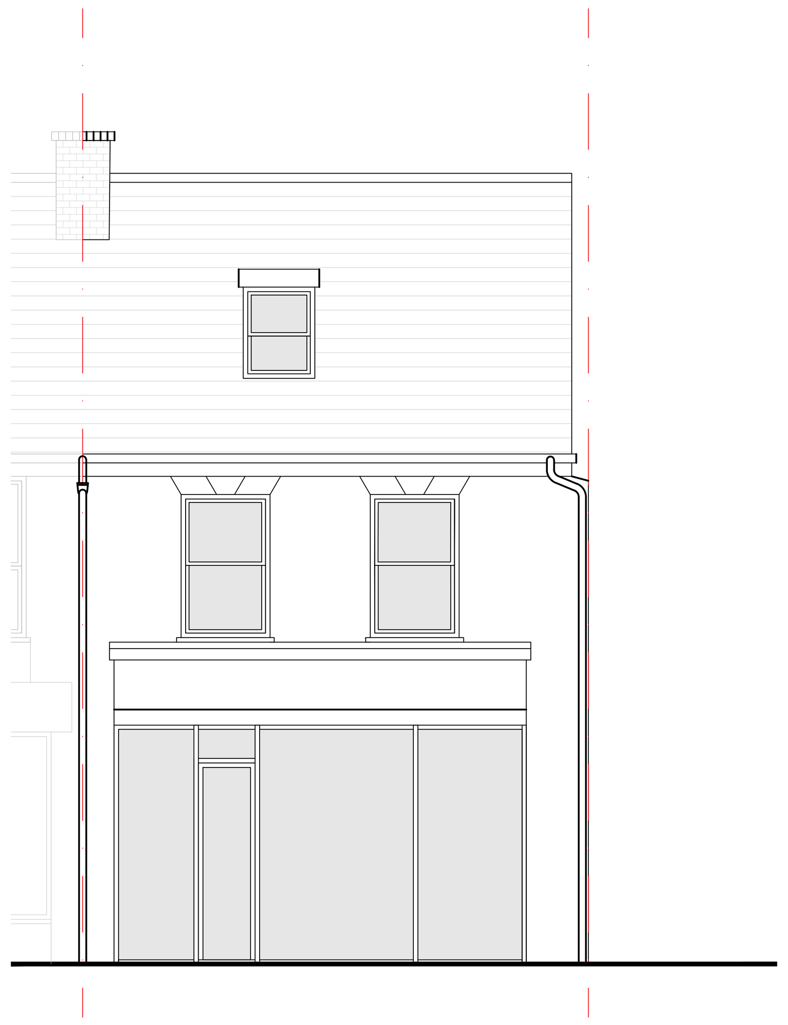


EXISTING FIRST FLOOR PLAN

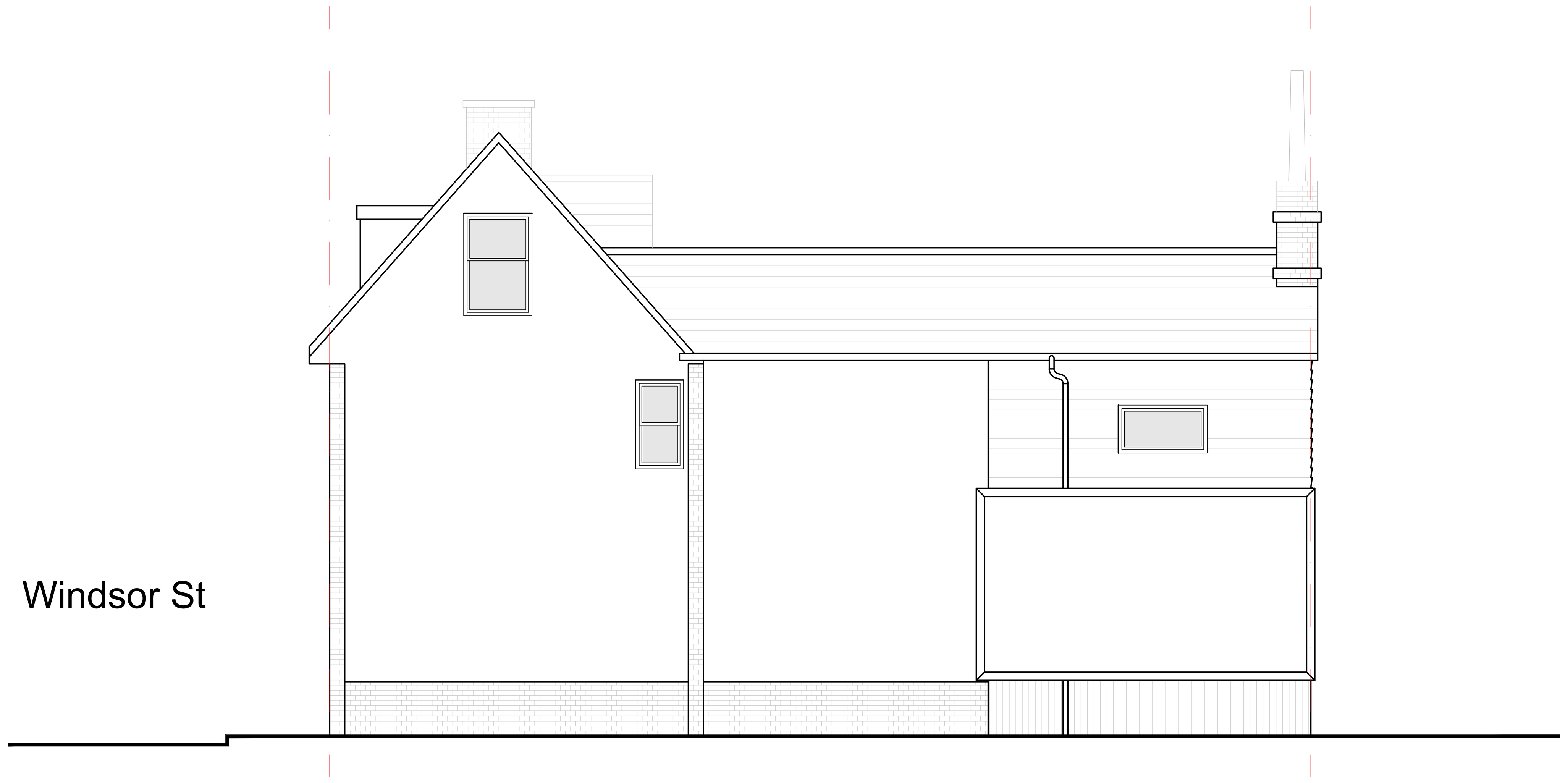


EXISTING ROOF PLAN

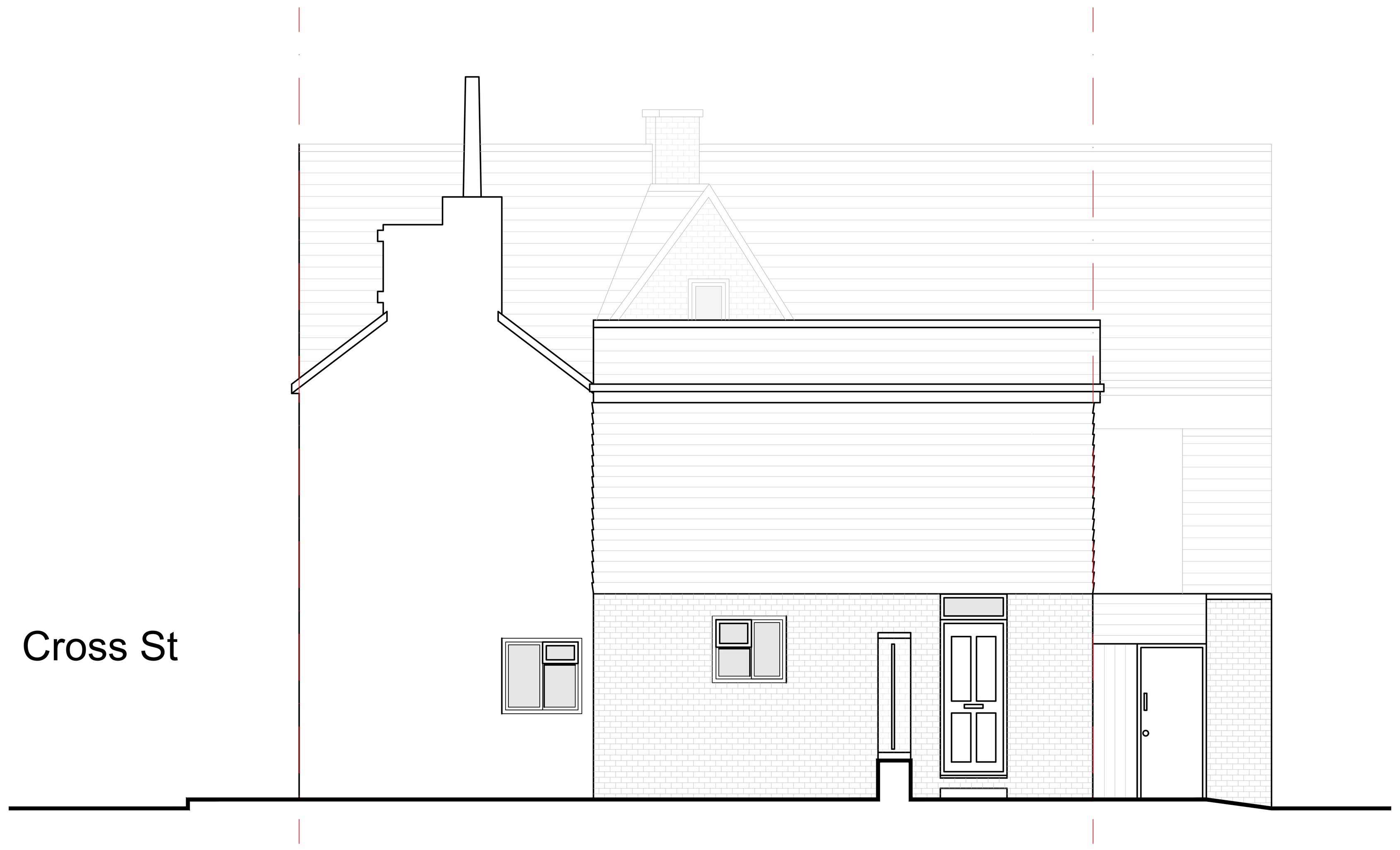
PROJECT	DWG NO.	SCALE	DETAIL	28.03.2022	PROJECT NO.	
23 WINDSOR STREET, UXBRIDGE, UB8 1AB	02	1:50 @ A0	EXISTING PLANS	ISSUED FOR DISCUSSION	23.10	**PR Architecture ltd.** Chartered Architect
PLANNING						120, Pinner Road, Harrow, HA1 4JD. Tel: 0208 357 2304



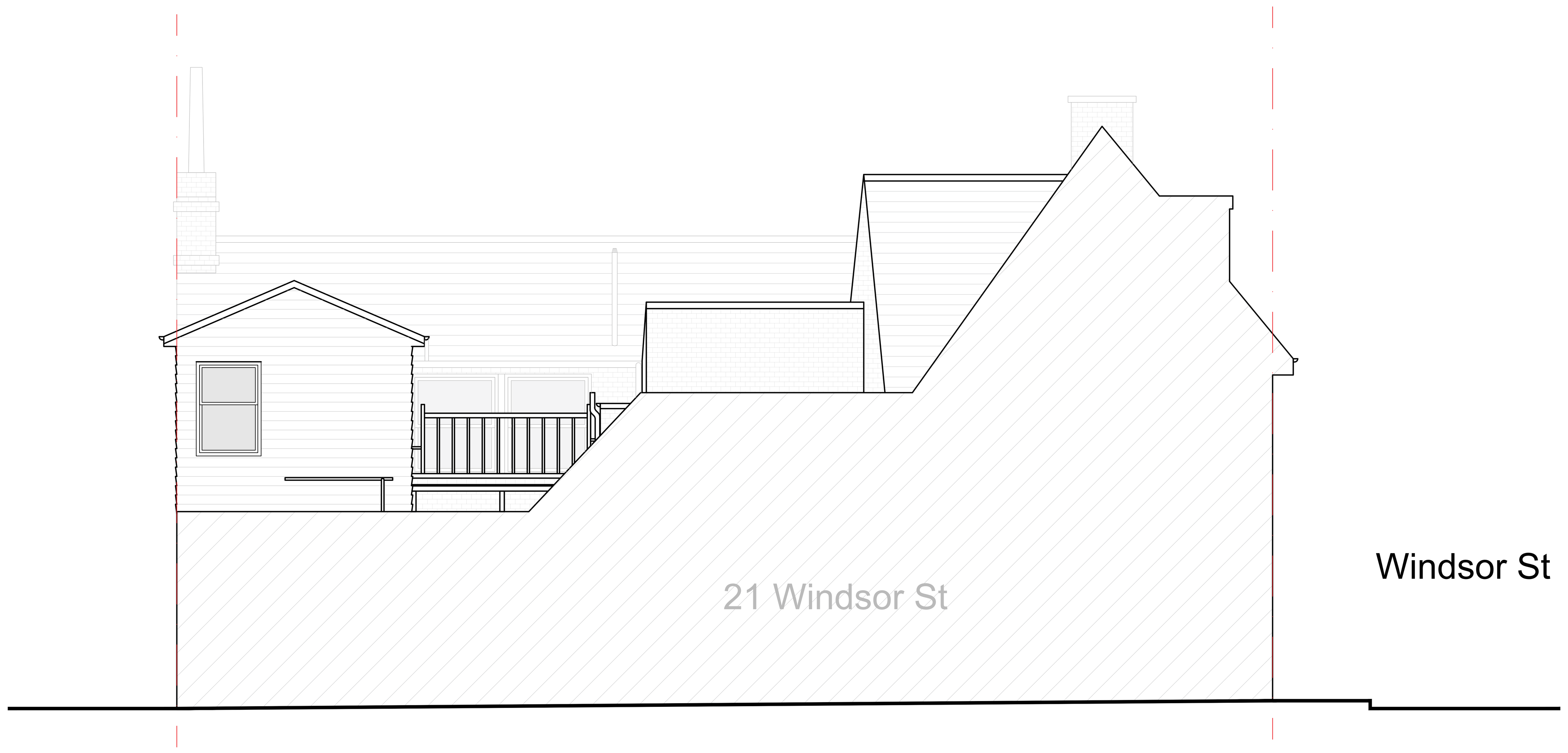
EXISTING FRONT ELEVATION



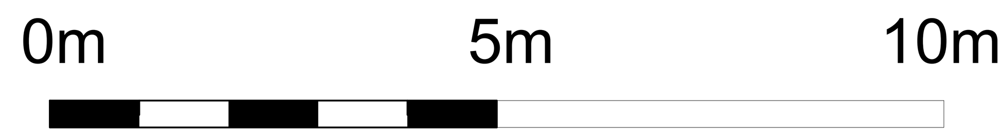
EXISTING SIDE ELEVATION



EXISTING REAR ELEVATION

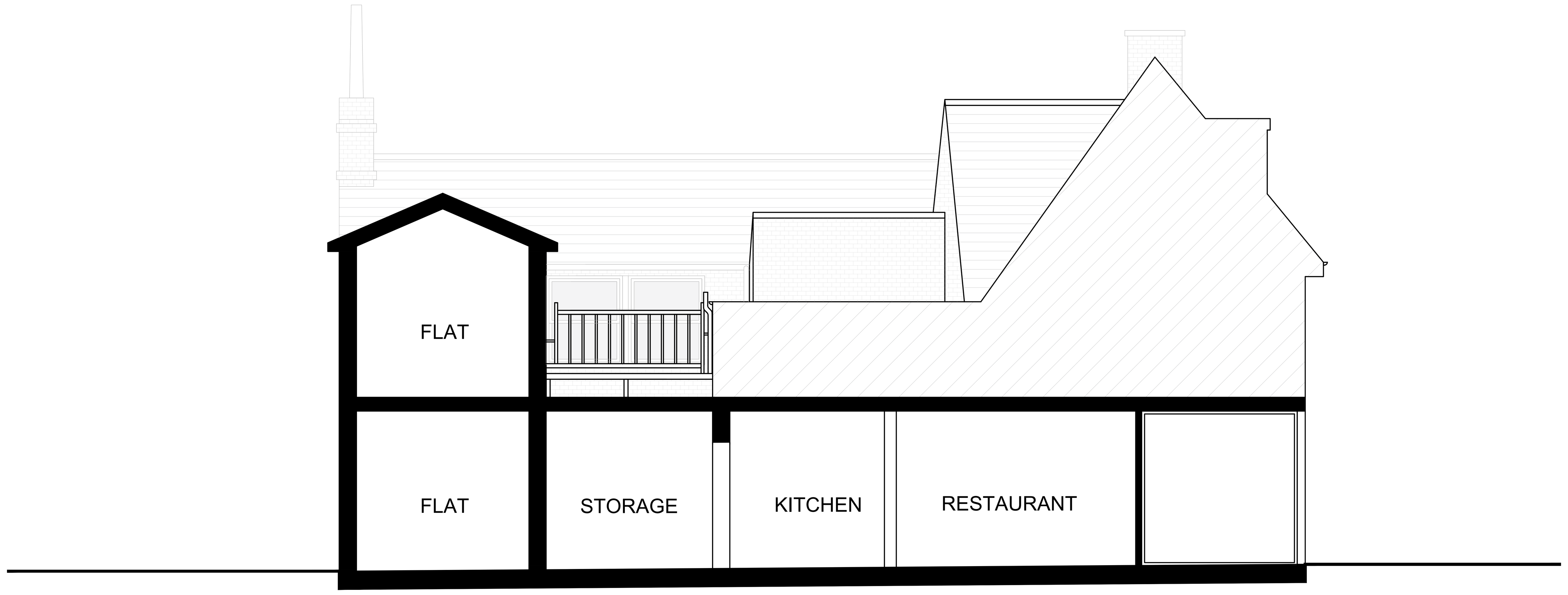


EXISTING SIDE ELEVATION

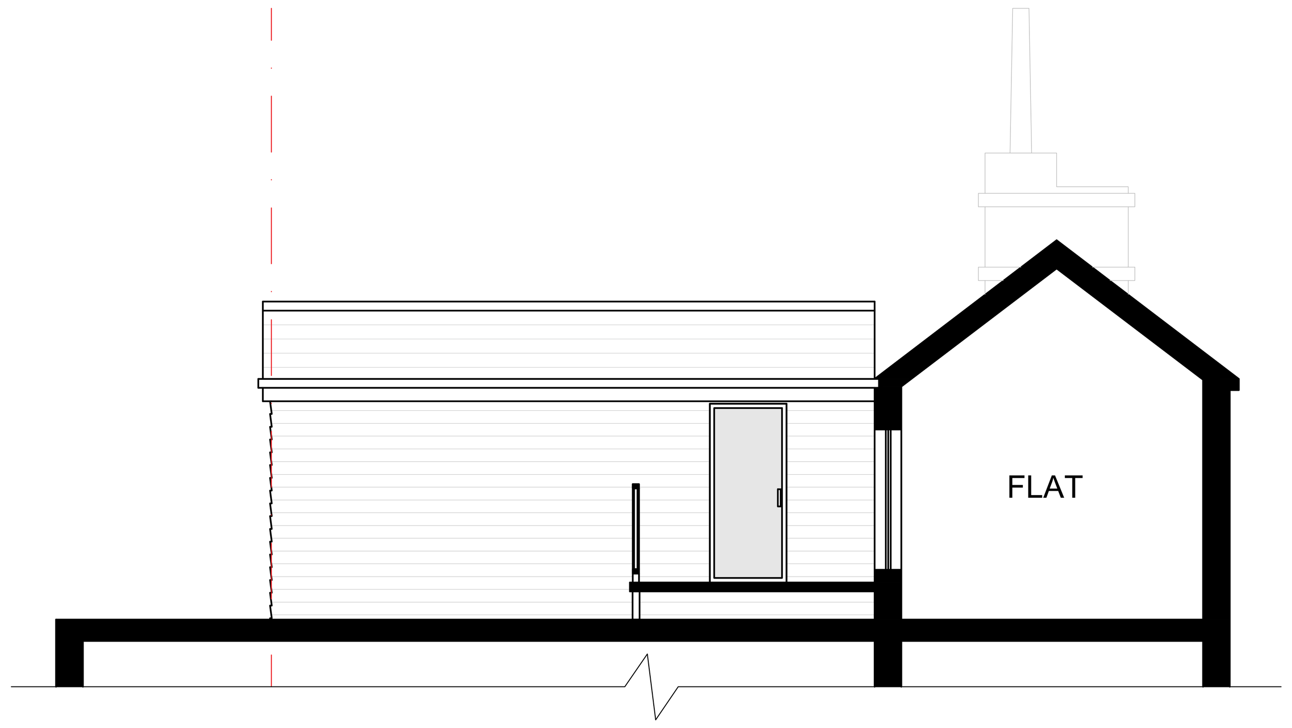


PROJECT	DWG NO.	SCALE	DETAIL	28.03.2022							PROJECT NO.	PR Architecture ltd.
23 WINDSOR STREET, UXBRIDGE, UB8 1AB	03	1:50 @ A0	EXISTING ELEVATIONS	ISSUED FOR DISCUSSION							23.10	Chartered Architect
PLANNING												120, Pinner Road, Harrow, HA1 4JD. Tel: 0208 357 2304

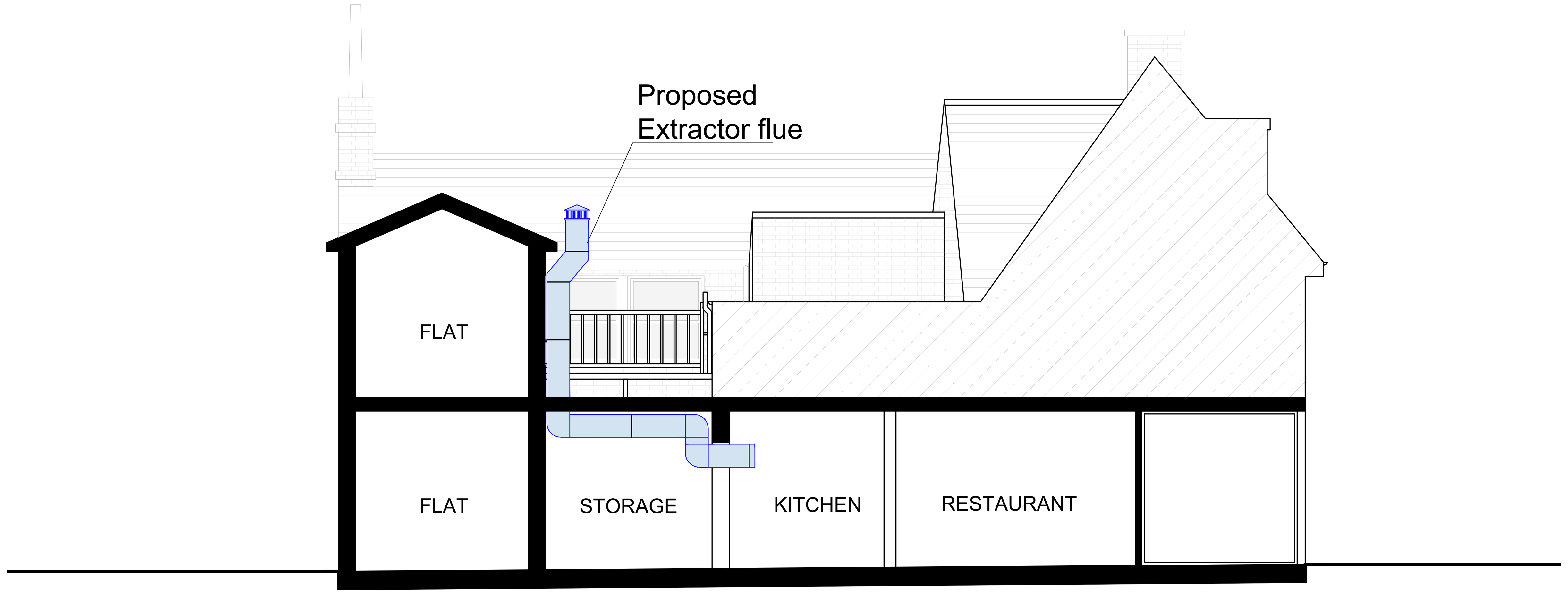
PROJECT	DWG NO.	SCALE	DETAIL	28.03.2022	PROJECT NO.	
23 WINDSOR STREET, UXBRIDGE, UB8 1AB	04	1:50 @ A0	PROPOSED PLANS	ISSUED FOR DISCUSSION	23.10	**PR Architecture ltd.** Chartered Architect
PLANNING						120, Pinner Road, Harrow, HA1 4JD. Tel: 0208 357 2304



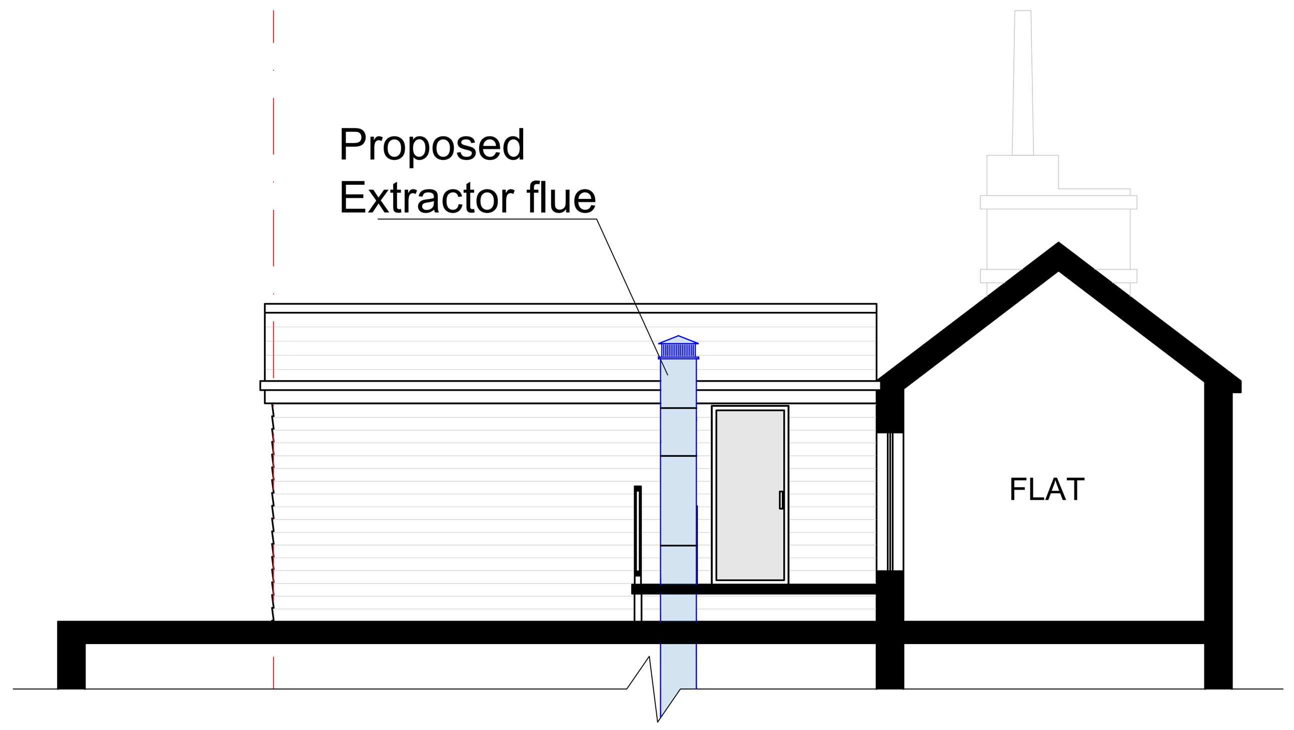
EXISTING SECTION A



EXISTING PART SECTION - ELEVATION B



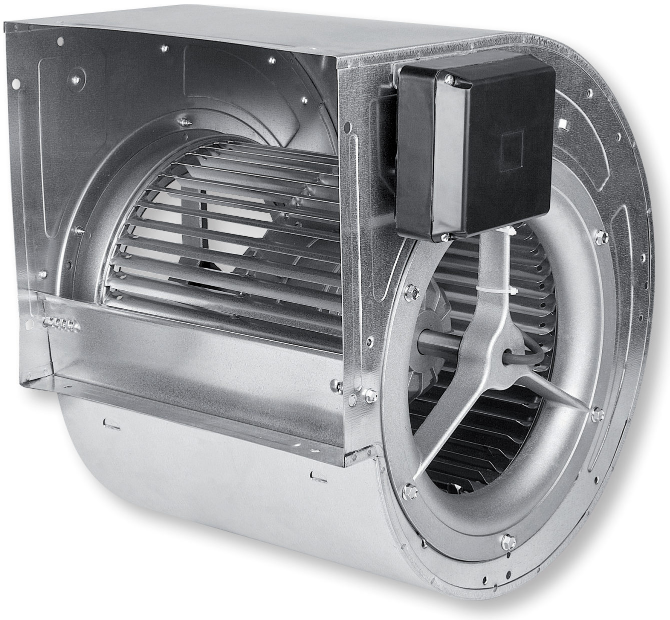
PROPOSED SECTION A

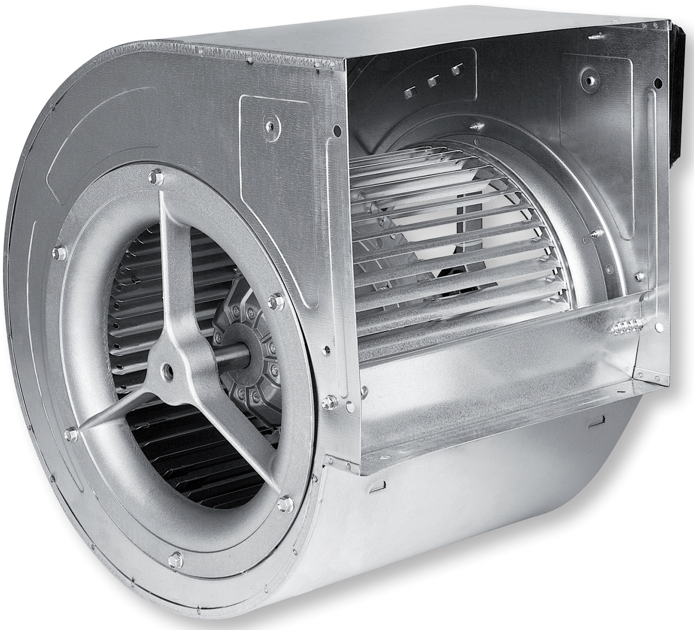


PROPOSED PART SECTION-ELEVATION B

PROJECT	DWG NO.	SCALE	DETAIL	28.03.2022	PROJECT NO.	
23 WINDSOR STREET, UXBRIDGE, UB8 1AB PLANNING	05	1:50 @ A0	EXISTING AND PROPOSED SECTIONS	ISSUED FOR DISCUSSION	23.10	PR Architecture ltd. Chartered Architect 120, Pinner Road, Harrow, HA1 4JD. Tel: 0208 357 2304

Appendix C: Proposed Equipment

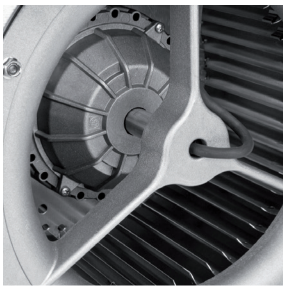




Range of direct-driven low pressure double inlet forward curve centrifugal fans. Casing and impeller manufactured from galvanized sheet steel.
All models incorporate speed controllable external rotor motor, fitted with thermal protection and ball bearings.

Motors
IP44, Class F (models 7/7 and 7/9).
IP55, Class F (models 9/7 to 12/12).
IP54, Class F (models 12/12 1100W and 15/15 2200W).
4 or 6 pole depending on version.
Electrical supply:
Single phase 230V-50Hz, suitable for speed control by voltage.
Three phase 230/400V-50Hz, suitable for speed control by tension and frequency inverter.
(See characteristics chart).

Impeller dynamically balanced
Impeller dynamically balanced, according to ISO 1940 standard, providing vibration free operation.



Anti-vibration mounts
All motors are fitted with support including rubber antivibration mounts reducing the noise transmitted to the installation.

CBM-7/7 72W and CBM-7/7 147W
Constructuve configuration of models CBM-7/7 72W and CBM-7/7 147W.

TECHNICAL CHARACTERISTICS

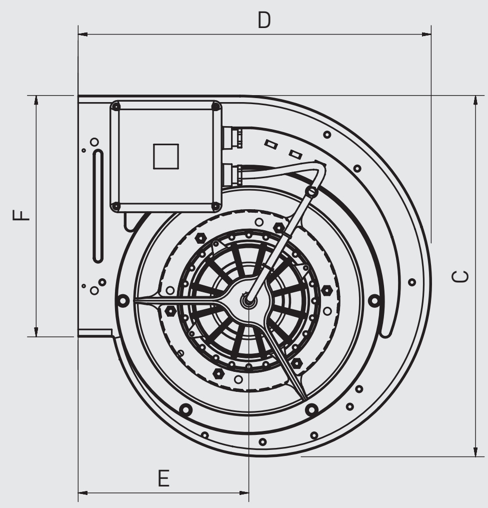
Before installation check that the product electrical characteristics listed on the data plate label (voltage, power, frequency, etc.) match those of the intended electrical supply.

Model	Motor power (W)	Speed (r.p.m)	Equivalence (mm)	Capacitor (µF/V)	Maximum absorbed current (A)	Maximum airflow (m³/h)	Maximum temper-ature air (ºC)	Sound pressure level * (dB(A))	Weight (kg)	Speed controller	
										REB	RMB
SINGLE PHASE MOTORS											
CBM-7/7 72W 6P RE VR	72	900	180/180	2,5/450	0,6	1.440	+70	56	6,5	1	1,5
CBM-7/7 147W 4P RE VR	147	1400	180/180	7/450	1,2	1.470	+40	63	6,9	2,5	1,5
CBM-7/7 300W 4P RE VR	300	1400	180/180	6/450	2,0	2.200	+60	64	7,2	2,5	3,5
CBM-7/9 72W 6P RE VR	72	900	180/240	2/450	0,9	1.850	+70	60	6,5	1	1,5
CBM-7/9 300W 4P RE VR	300	1400	180/240	6/450	2,2	2.530	+40	67	9,8	2,5	3,5
CBM-9/7 200W 6P RE VR	200	900	240/180	4/450	1,5	1.900	+40	59	13,5	2,5	1,5
CBM-9/7 245W 6P RE VR	245	900	240/180	13/450	2,0	2.650	+50	64	14	2,5	3,5
CBM-9/7 420W 4P RE VR	420	1400	240/180	15/450	3,2	2.600	+40	68	14,5	5	3,5
CBM-9/9 200W 6P RE VR	200	900	240/240	5/450	1,8	2.760	+40	63	14	2,5	3,5
CBM-9/9 245W 6P RE VR	245	900	240/240	13/450	2,2	2.870	+40	64	14,1	2,5	3,5
CBM-9/9 300W 4P RE VR	300	1400	240/240	20/450	2,8	2.500	+40	64	16,7	5	3,5
CBM-9/9 550W 4P RE VR	550	1400	240/240	20/450	4,3	3.470	+40	71	17,7	5	8
CBM-10/8 245W 6P RE VR	245	900	270/200	9/450	2,8	3.490	+40	67	14,9	5	3,5
CBM-10/8 515W 6P RE VR	515	900	270/200	10/450	3,3	3.750	+40	71	19,5	5	8
CBM-10/8 550W 4P RE VR	550	1400	270/200	20/450	4,2	2.900	+40	68	18,6	5	8
CBM-10/10 245W 6P RE VR	245	900	270/270	9/450	2,8	3.370	+40	64	16	5	3,5
CBM-10/10 515W 6P RE VR	515	900	270/270	10/450	3,4	4.090	+40	67	17,5	5	8
CBM-10/10 600W 4P RE VR	600	1400	270/270	20/450	4,6	3.300	+40	68	20,8	5	8
CBM-12/9 515W 6P RE VR	515	900	320/320	18/450	4,1	4.195	+40	65	21,5	5	8
CBM-12/9 750W 6P RE VR	750	900	320/240	20/450	5,5	4.990	+40	67	23,5	10	8
CBM-12/12 515W 6P RE VR	515	1400	320/320	18/450	4,2	4.540	+40	66	22	5	8
CBM-12/12 750W 6P RE VR	750	900	320/320	20/450	5,3	5240	+40	68	24	10	8

Model	Motor power (W)	Speed (r.p.m)	Equivalence (mm)	Maximum absorbed current (m³/h)		Max. airflow (m³/h)	Maximum temper-ature air (ºC)	Sound pressure level * (dB(A))	Weight (kg)	Speed controller RMT	Inverter controller VFTM Power supply	
				230V	400V						1/230V	3/400V
THREE PHASE MOTORS												
CBM-7/7 250W 4P T RE VR	250	1400	180/180	1,2	0,7	2.320	+65	65	7,1	1,5	VFTM MONO 0,18	VFTM TRI 0,37
CBM-9/7 550W 4P T RE VR	550	1400	240/180	3,1	1,8	3.350	+40	70	14	2,5	VFTM MONO 0,37	VFTM TRI 0,55
CBM-9/9 245W 6P T RE VR	245	900	240/240	1,6	0,9	3.330	+40	67	14,1	1,5	VFTM MONO 0,37	VFTM TRI 0,37
CBM-9/9 550W 4P T RE VR	550	1400	240/240	5,5	3,2	4.830	+40	75	14,1	5	VFTM MONO 1,1	VFTM TRI 1,1
CBM-10/8 245W 6P T RE VR	245	900	270/200	1,9	1,1	3.470	+40	68	14,9	1,5	VFTM MONO 0,37	VFTM TRI 0,37
CBM-10/8 350W 6P T RE VR	350	900	270/200	2,8	1,6	4.330	+40	73	14,9	2,5	VFTM MONO 0,37	VFTM TRI 0,55
CBM-10/8 550W 4P T RE VR	550	1400	270/200	5,4	3,1	4.230	+40	72	18,9	5	VFTM MONO 1,1	VFTM TRI 1,1
CBM-10/10 245W 6P T RE VR	245	900	270/270	1,9	1,1	3.920	+40	67	16	1,5	VFTM MONO 0,37	VFTM TRI 0,37
CBM-10/10 350W 6P T RE VR	350	900	270/270	2,9	1,7	5.000	+40	72	20	2,5	VFTM MONO 0,37	VFTM TRI 0,55
CBM-10/10 550W 4P T RE VR	550	1400	270/270	5,0	2,9	4.010	+40	70	20	5	VFTM MONO 1,1	VFTM TRI 1,1
CBM-10/10 750W 4P T RE VR	750	1400	270/270	7,6	4,4	5.880	+40	76	20	5	VFTM MONO 1,5	VFTM TRI 1,5
CBM-12/12 550W 6P T RE VR	550	900	320/320	5,0	2,9	6.490	+40	73	22	5	VFTM MONO 1,1	VFTM TRI 1,1
CBM-12/12 750W 6P T RE VR	750	900	320/320	5,9	3,4	7480	+40	75	22	5	VFTM MONO 1,1	VFTM TRI 1,5
CBM-12/12 1100W 6P T RE VR	1100	900	320/320	5,7	3,3	7.410	+40	75	25	5	VFTM MONO 1,1	VFTM TRI 1,5
CBM-15/15 2200W 6P T RE VR K	2200	900	380/380	12,2	7	11.650	+40	75	43	8	-	VFTM TRI 3

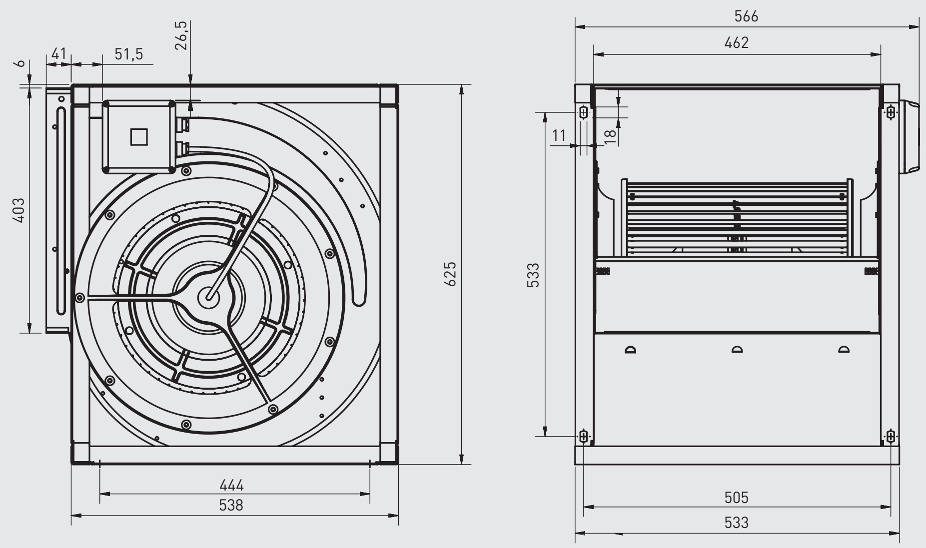
* Sound pressure levels in dB(A), measured at 1,5 meters at the fan inlet side in free field.

DIMENSIONS (mm)

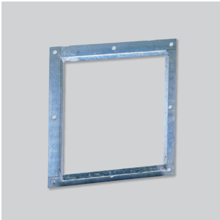


Model	A	B	C	D	E	F
CBM-7/7	296	233	328	309	145	207
CBM-7/9	363	300	328	309	145	207
CBM-9/7	316	233	390	381	184	260
CBM-9/9	382	300	390	381	184	260
CBM-10/8	340	267	443	423	200	288
CBM-10/10	407	333	443	423	200	288
CBM-12/9	382	311	521	490	229	341
CBM-12/12	466	396	521	490	229	341

DIMENSIONS MODEL CBM-15/15 2200 6PT RE VR K (mm)



MOUNTING ACCESSORIES

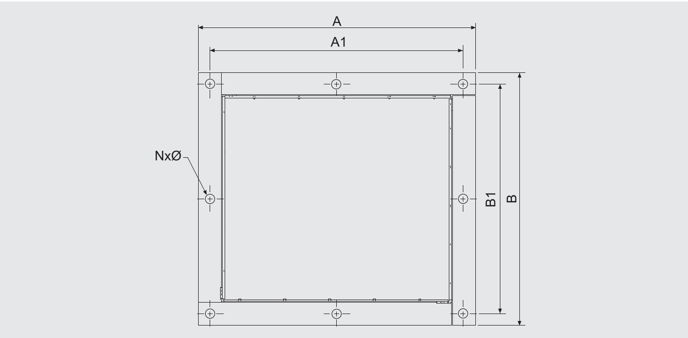

Outlet flange CBM


Mounting feet

Model	Outlet flange CBM	Mounting feet	Inlet guard
CBM-7/7	BRIDA DESCARGA CBM-7/7	PIE SOPORTE CBM-RE-7	DEF-CBM-RE-7
CBM-7/9	BRIDA DESCARGA CBM-7/9	PIE SOPORTE CBM-RE-7	DEF-CBM-RE-7
CBM-9/7	BRIDA DESCARGA CBM-9/7	PIE SOPORTE CBM-RE-9	DEF-CBM-RE-9
CBM-9/9	BRIDA DESCARGA CBM-9/9	PIE SOPORTE CBM-RE-9	DEF-CBM-RE-9
CBM-10/8	BRIDA DESCARGA CBM-10/8	PIE SOPORTE CBM-RE-10	DEF-CBM-RE-10
CBM-10/10	BRIDA DESCARGA CBM-10/10	PIE SOPORTE CBM-RE-10	DEF-CBM-RE-10
CBM-12/9	BRIDA DESCARGA CBM-12/9	PIE SOPORTE CBM-RE-12	DEF-CBM-RE-12
CBM-12/12	BRIDA DESCARGA CBM-12/12	PIE SOPORTE CBM-RE-12	DEF-CBM-RE-12

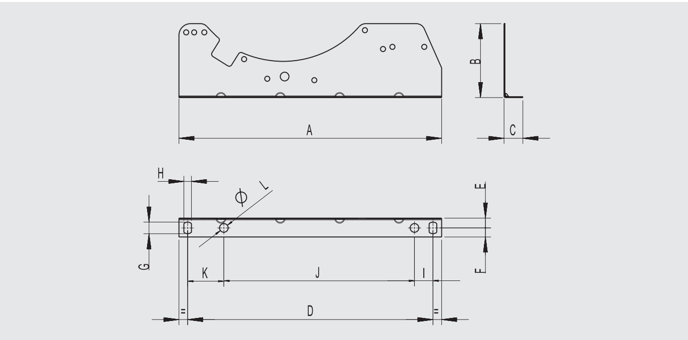
ACCESSORIES DIMENSIONS (mm)

Outlet flange CBM



Model	A	A1	B	B1	NxØ (mm)
BRIDA DESCARGA CBM-7/7	289	264	265	240	8x9
BRIDA DESCARGA CBM-7/9	314	297	253	231	8x9
BRIDA DESCARGA CBM-9/7	273	253	302	280	8x9
BRIDA DESCARGA CBM-9/9	360	328	315	285	8x10
BRIDA DESCARGA CBM-10/8	314	293	339	316	8x9
BRIDA DESCARGA CBM-10/10	380,5	359	339	316	8x9
BRIDA DESCARGA CBM-12/9	362	341	394,5	374	8x9
BRIDA DESCARGA CBM-12/12	447	426	394,5	374	8x9

Mounting feet



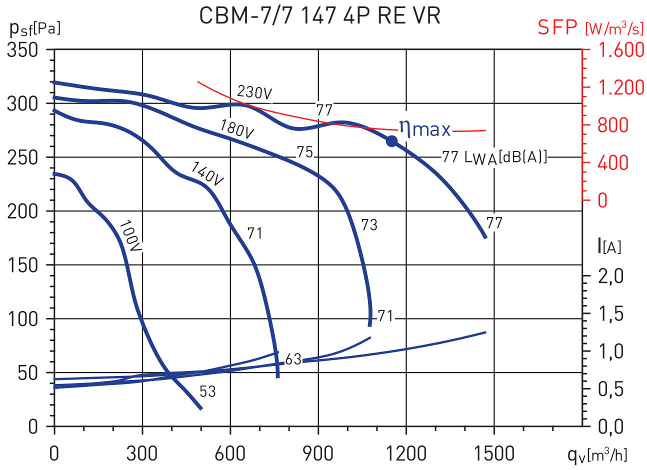
Model	A	B	C	D	E	F	G	H	I	J	K	L
7/	246	39	26	225	14	12	16	11	15	195	15	12
9/	320	89	26	307	13	13	16	11	-	-	35,7	10,5
10/	363	80	26	339	13,5	12,5	16	10,5	25,5	263,5	50	12
12/	430	115	26	407	13,5	12,5	16	10,5	48	333,5	25,5	12

PERFORMANCE CURVES

- q_v: Airflow in m³/h.
- p_{sf}: Static pressure in Pa.
- SFP: Specific fan power in W/m³/s.
- I: Absorbed power A.
- LW: Sound power levels, at inlet, in dB(A).
- Measurement category: B.
- Efficiency category: total.
- Fan efficiency without speed control.
- Airflow data in accordance with ISO 5801.

MC Measurement category
EC Efficiency category
VSD Speed control: supplied with the fan
SR Specific ratio
η[%] Efficiency
N Efficiency grade
[kW] Absorbed power
[m³/h] Airflow
[Pa] Static pressure
[RPM] Speed

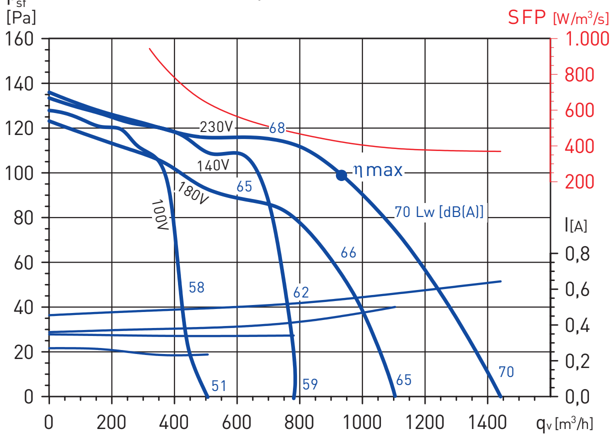
EXAMPLE CURVE



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	39,0	49,3	0,239	1.150	292	1346

PERFORMANCE CURVES - Single phase motor

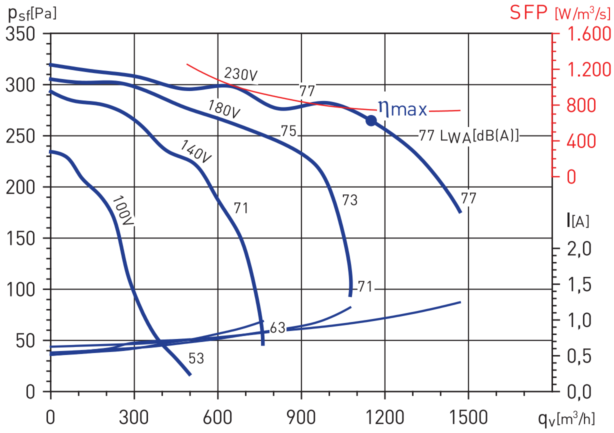
CBM-7/7 72 6P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	27,7	40,1	0,110	933	117	883

* See example curve.

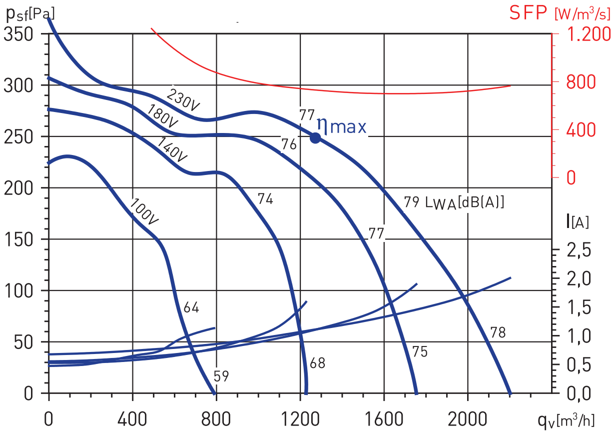
CBM-7/7 147 4P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	39,0	49,3	0,239	1.150	292	1346

* See example curve.

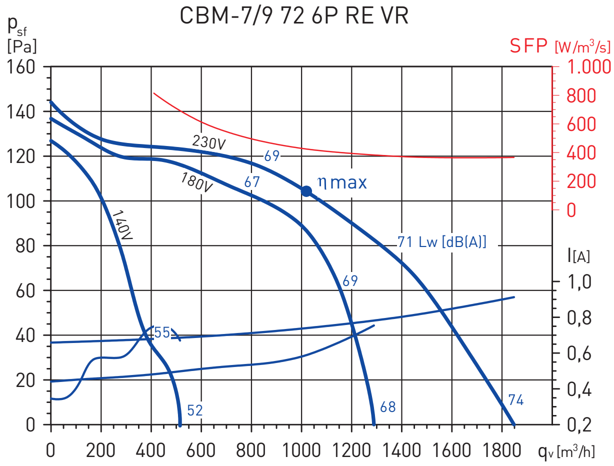
CBM-7/7 300 4P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	39,1	49,1	0,258	1.270	286	1370

* See example curve.

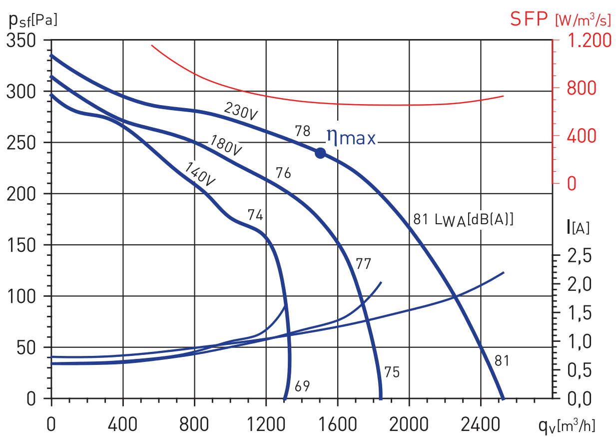
CBM-7/9 72 6P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	27,4	39,5	0,120	1.020	116	920

* See example curve.

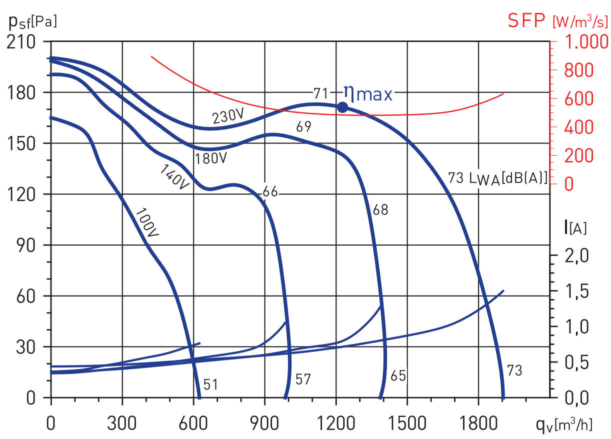
CBM-7/9 300 4P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	39,5	49,3	0,283	1.508	266	1343

* See example curve.

CBM-9/7 200 6P RE VR

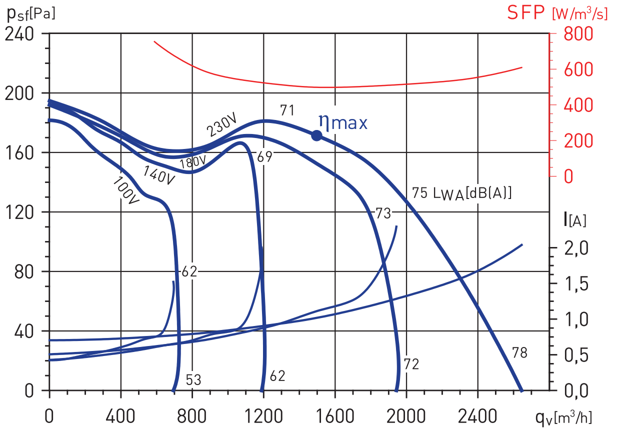


MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	39,5	50,8	0,165	1.227	191	914

* See example curve.

PERFORMANCE CURVES - Single phase motor

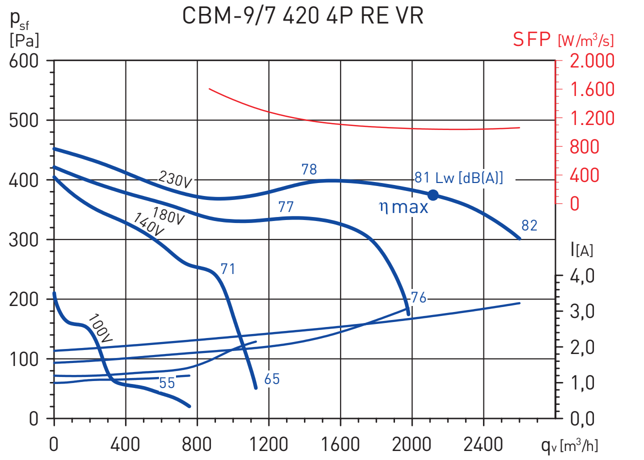
CBM-9/7 245 6P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	40,0	50,6	0,207	1.495	200	951

* See example curve.

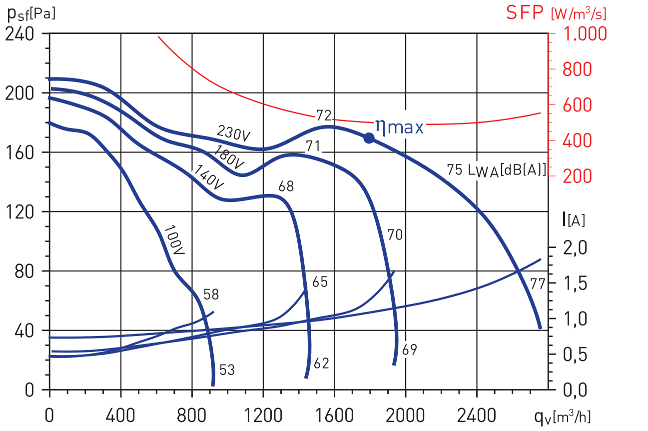
CBM-9/7 420 4P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	41,3	49,0	0,612	2.118	429	1377

* See example curve.

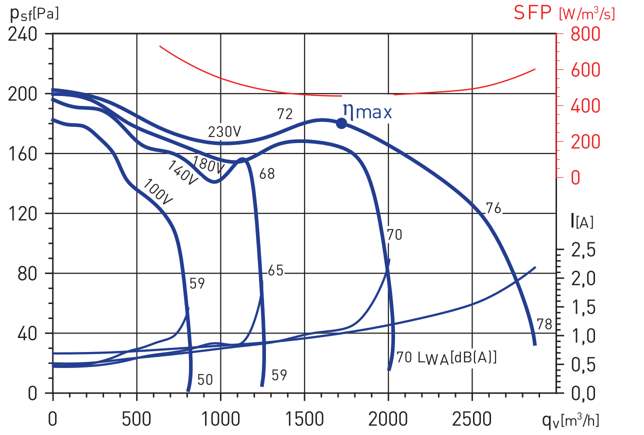
CBM-9/9 200 6P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	38,9	49,0	0,249	1.792	195	915

* See example curve.

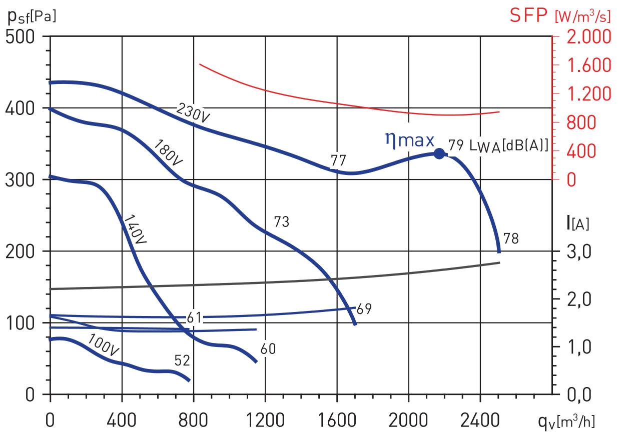
CBM-9/9 245 6P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	44,5	55,0	0,215	1.714	201	947

* See example curve.

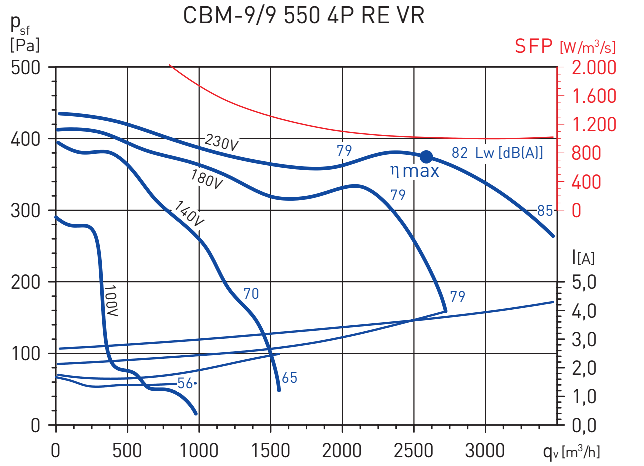
CBM-9/9 300 4P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	41,1	49,1	0,545	2.177	374	1277

* See example curve.

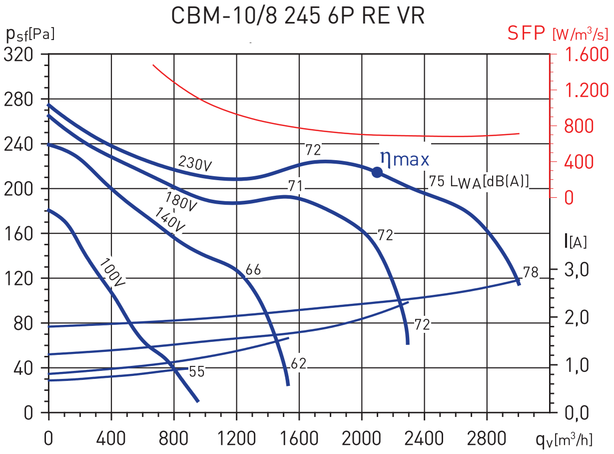
CBM-9/9 550 4P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	41,8	49,0	0,730	2.588	424	1387

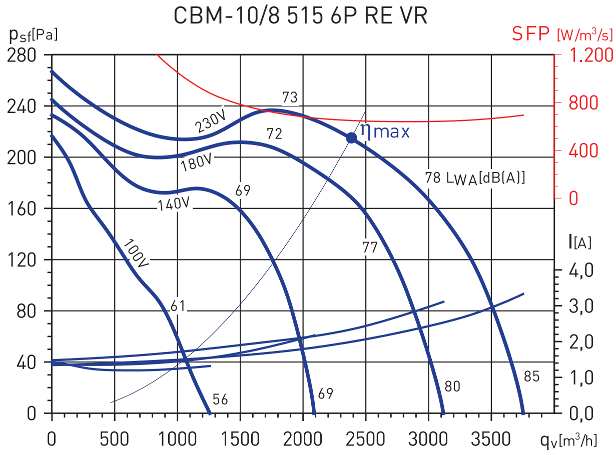
* See example curve.

PERFORMANCE CURVES - Single phase motor



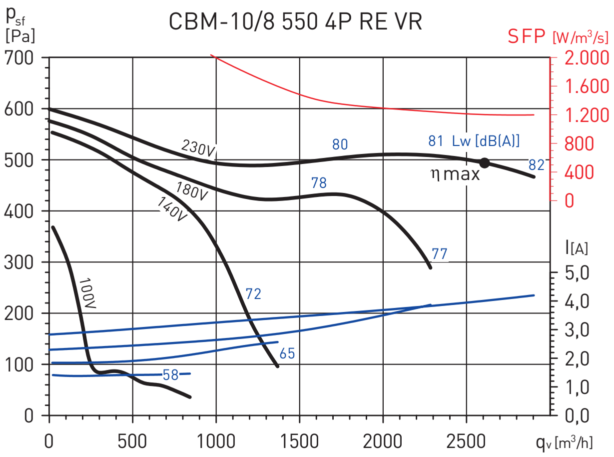
MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	45,5	54,3	0,405	2.336	284	949

* See example curve.



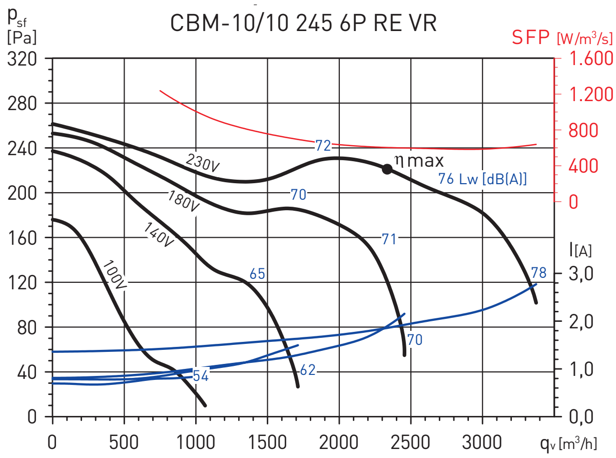
MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	40,4	49,0	0,430	2.382	262	917

* See example curve.



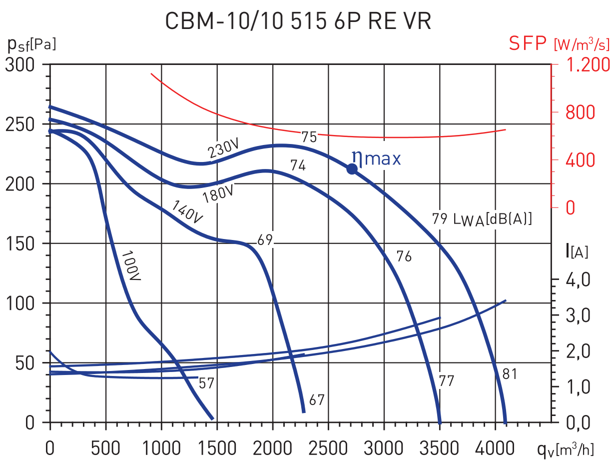
MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	45,1	51,8	0,872	2.610	542	1353

* See example curve.



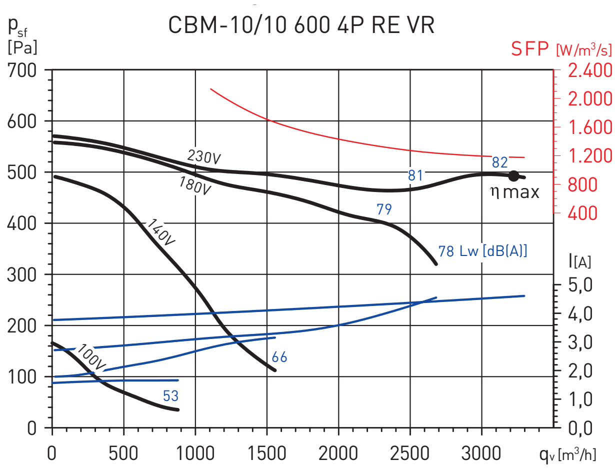
MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	41,0	49,9	0,391	2.334	248	905

* See example curve.



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	42,6	51,2	0,440	2.654	254	914

* See example curve.

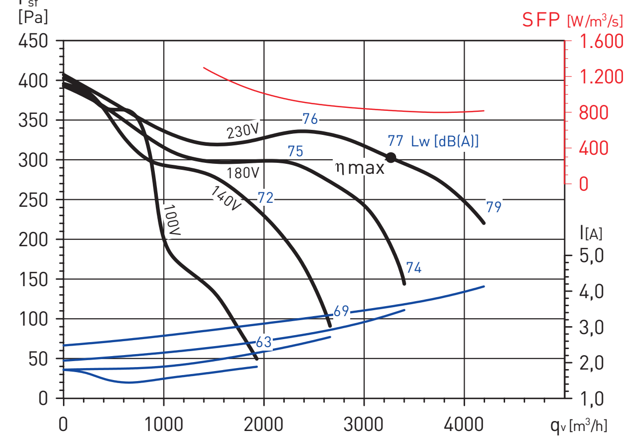


MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	45,9	52,1	1,056	3.226	542	1357

* See example curve.

PERFORMANCE CURVES - Single phase motor

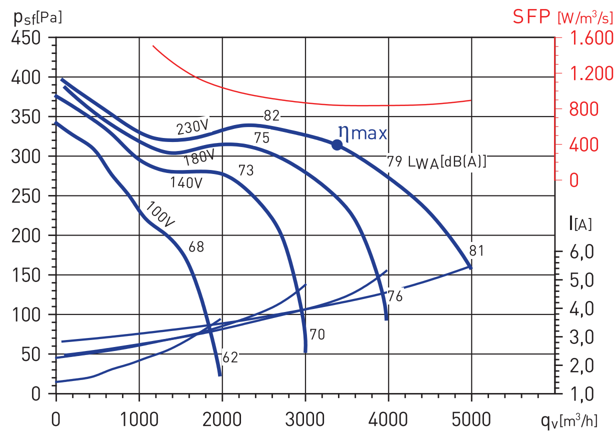
CBM-12/9 515W 6P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	42,6	49,7	0,744	3.267	349	885

* See example curve.

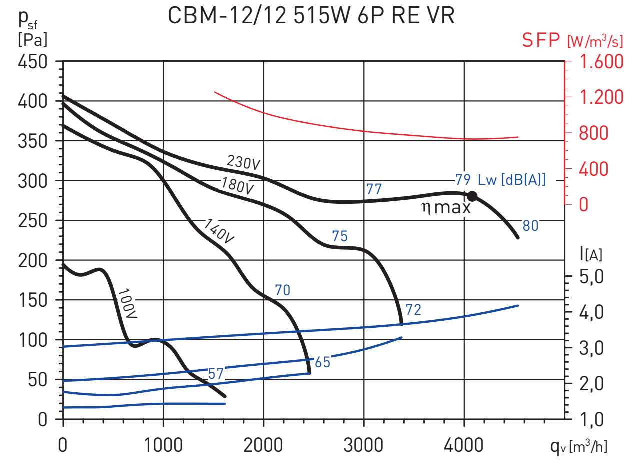
CBM-12/9 750 6P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	42,9	49,9	0,788	3.380	360	913

* See example curve.

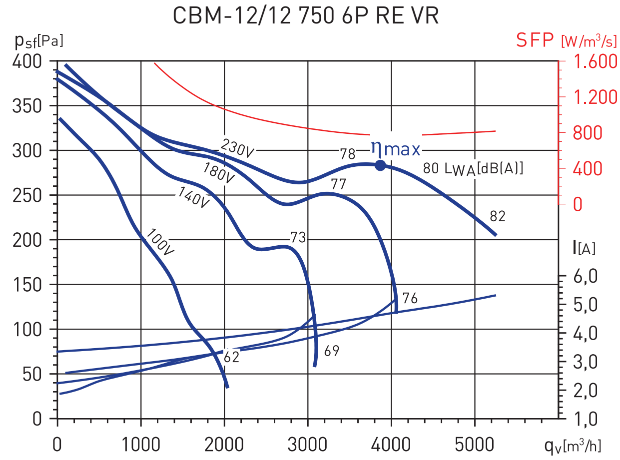
CBM-12/12 515W 6P RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	43,8	50,7	0,826	4.084	323	865

* See example curve.

CBM-12/12 750 6P RE VR

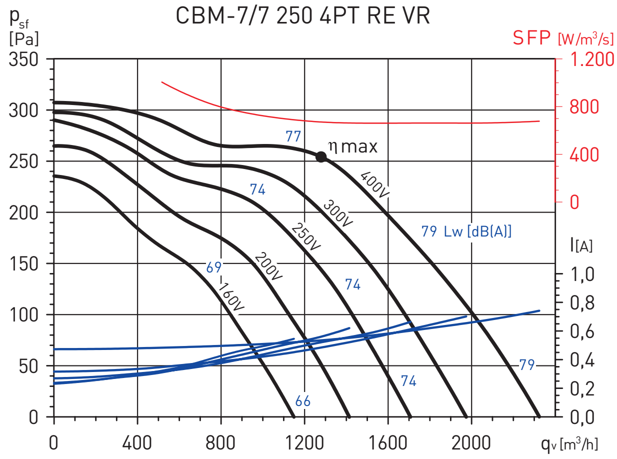


MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	42,3	49,1	0,832	3.900	325	899

* See example curve.

PERFORMANCE CURVES - Three phase motor

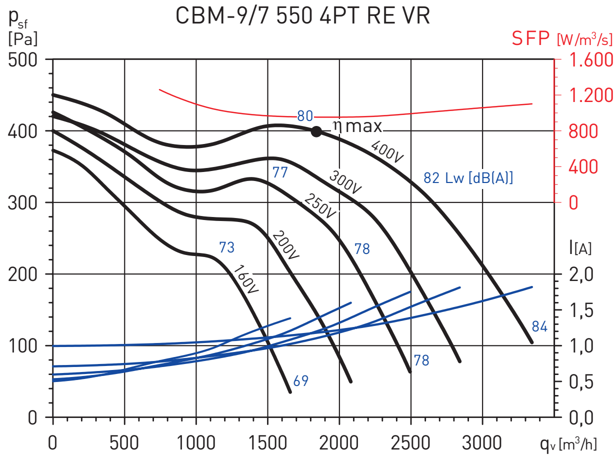
CBM-7/7 250 4PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	45,2	55,5	0,238	1.280	303	1359

* See example curve.

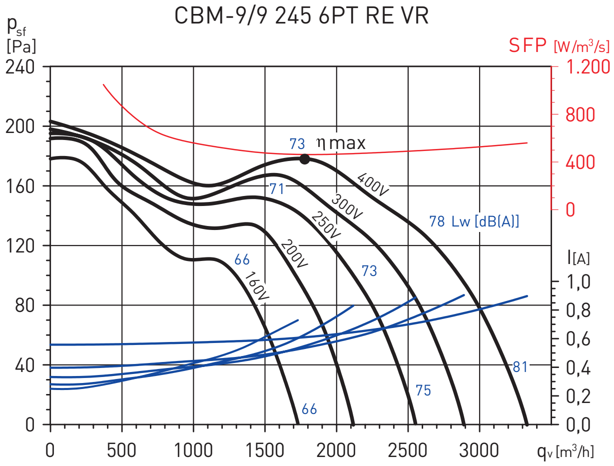
CBM-9/7 550 4PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	46,7	55,0	0,487	1.839	445	1396

* See example curve.

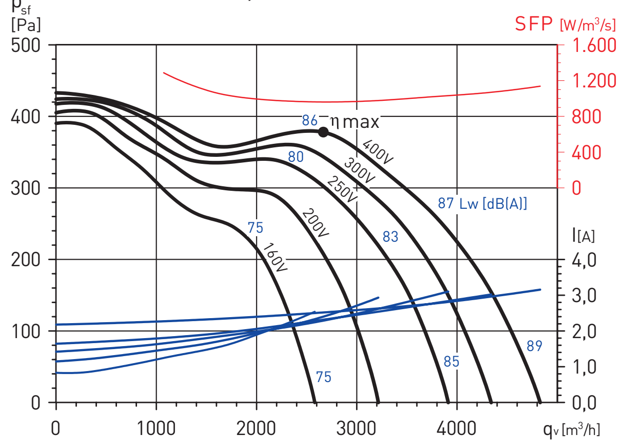
CBM-9/9 245 6PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	0	43,9	54,3	0,230	1.787	203	947

* See example curve.

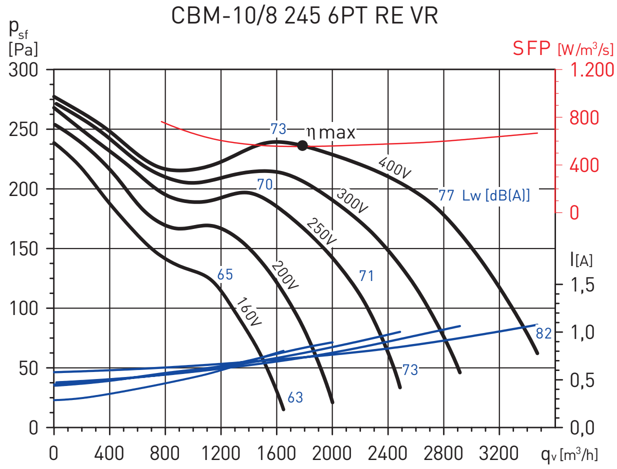
CBM-9/9 550 4PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	44,9	52,2	0,711	2.663	433	1430

* See example curve.

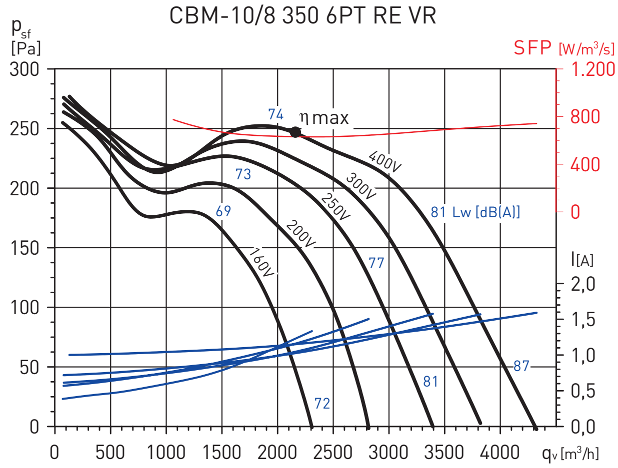
CBM-10/8 245 6PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	46,6	56,5	0,273	1.774	258	931

* See example curve.

CBM-10/8 350 6PT RE VR

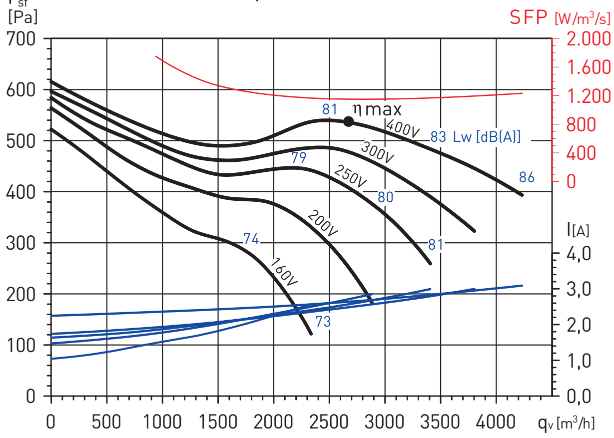


MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	44,3	53,3	0,377	2.147	280	954

* See example curve.

PERFORMANCE CURVES - Three phase motor

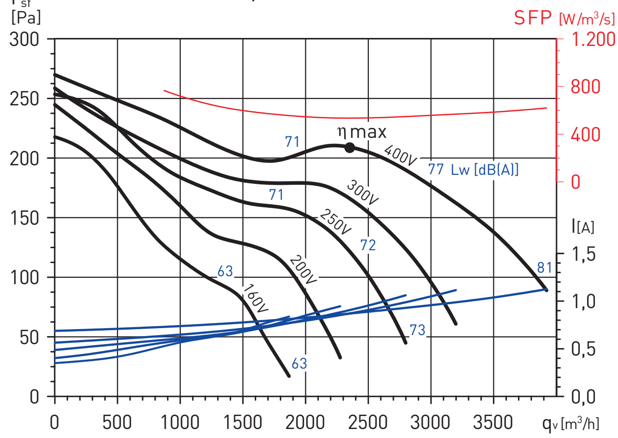
CBM-10/8 550 4PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	50,5	57,3	0,853	2.668	581	1409

* See example curve.

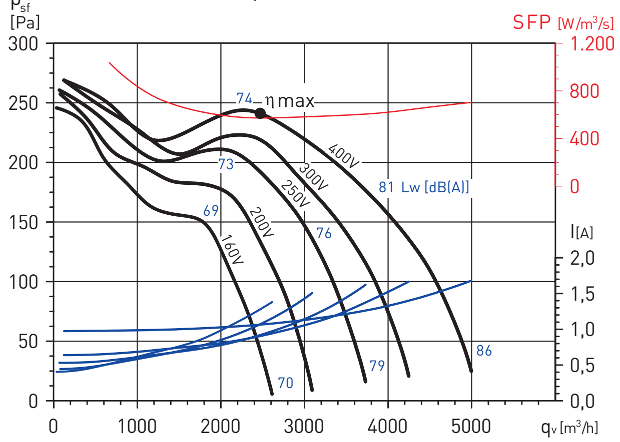
CBM-10/10 245 6PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	43,8	53	0,35	2.357	234	906

* See example curve.

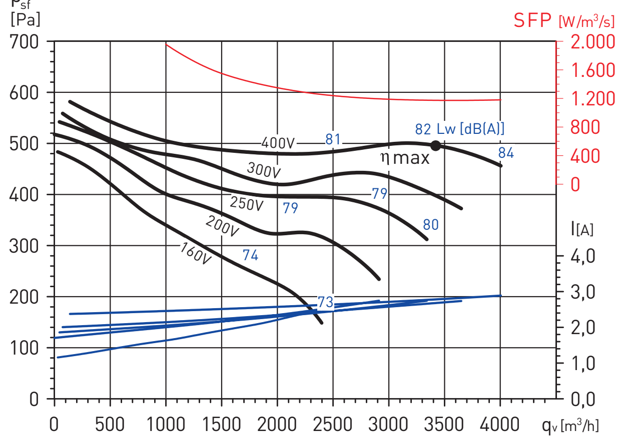
CBM-10/10 350 6PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	46,9	55,8	0,393	2.465	269	949

* See example curve.

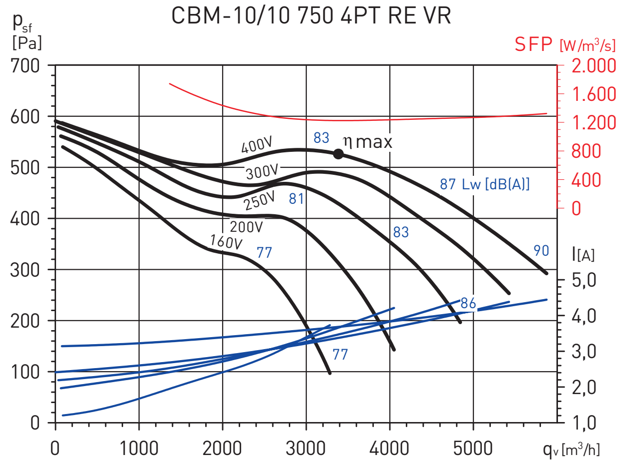
CBM-10/10 550 4PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	46,9	52,9	1,116	3.422	550	1373

* See example curve.

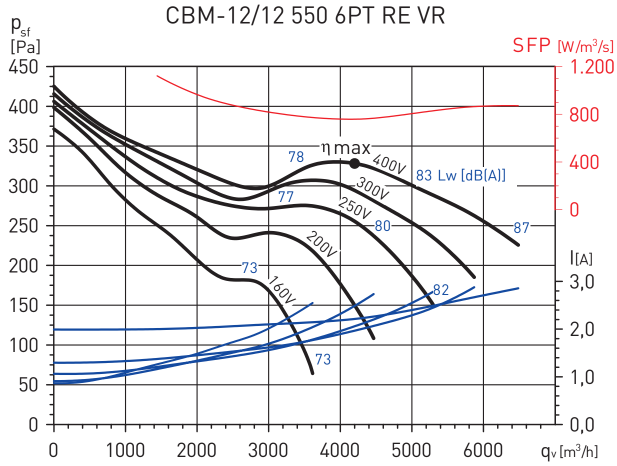
CBM-10/10 750 4PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	47,8	53,7	1,150	3.379	586	1.431

* See example curve.

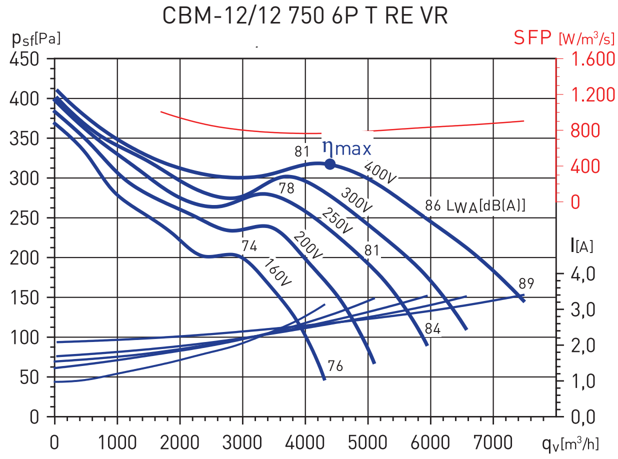
CBM-12/12 550 6PT RE VR



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	50,7	57,4	0,886	4.202	387	939

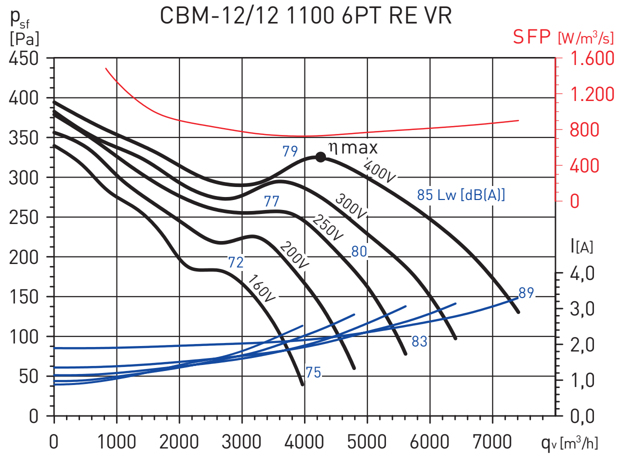
* See example curve.

PERFORMANCE CURVES - Three phase motor



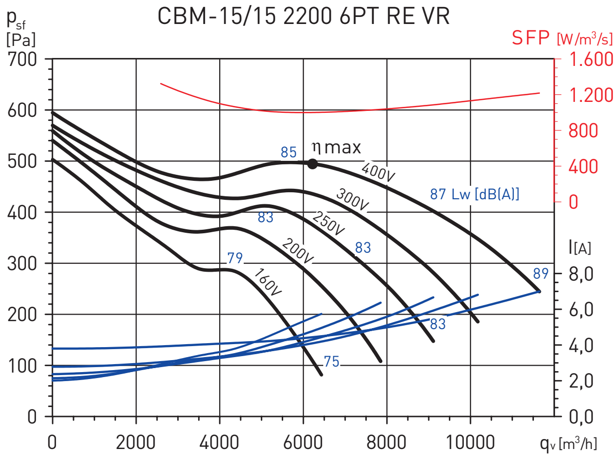
MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	47,9	54,4	0,937	4.397	368	936

* See example curve.



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	51,0	57,7	0,862	4.247	373	925

* See example curve.



MC*	EC*	VSD*	SR*	η[%]*	N*	[kW]	[m³/h]	[Pa]	[RPM]
B	Total	No	1	54,7	59,5	1,725	6.209	547	934

* See example curve.