PO Box 1030, Warrington, Cheshire WA4 9FJ
www.adcacoustics.co.uk

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16th April 2026
Rev A 20th April 2026

Wynne Construction

RIBA Stage 3 Acoustic Report for Flintshire Archives (JAF)

Prepared for:-

Wynne Construction
Charles House
Kinmel Park
Bowdelwydden
LL18 5TY

CONTENTS

Limit of Liability

The guidance and examples provided in this report are solely focused on identifying potential acoustic factors that may arise during the design and construction process. They are intended for advisory purposes only and should be integrated into the Architect's Design Drawings where applicable, for review and confirmation by all relevant parties and other specialists.

1.0 SUMMARY

The Stage 3 report builds on the Stage 2 report, dated 20th February 2026, which covered the basic requirements for the various spaces and discussed how the guidance can be interpreted. Since then the designs have progressed and we are now in a position to move to Stage 3, which includes more specific recommendations and discussions of the expected outcomes.

At stage 2 the idealised criteria were presented, followed by a discussion of the feasibility of achieving them. It was also pointed out that operators would be likely to have to manage the levels of activity noise against expectations of quiet conditions. We expand on this here and propose recommended performance standards for discussion at the upcoming presentation.

Wall build-ups are likely to be based on Knauf 70 mm stud systems and are currently subject to other considerations such structural and fire. Doors and glazed partitions will have a significant impact on the overall performance of the partitions. This will be especially so for sensitive areas adjoining the Discovery Area and is discussed at some length.

Separating floors are likely to achieve and exceed requirements for sound insulation.

Most areas are likely to be carpeted, but further absorption is recommended noisier areas as well as the most sensitive, to improve the internal acoustic environments and to reduce noise build-up.

Mechanical services noise criteria have been reproduced from the Stage 2 report.

A R Raymond

P J Durell

2.0 INTRODUCTION

This report is intended to cover RIBA Stage 3 requirements. Specifically, this would normally include:-

- Acoustic performance requirements for façade elements to achieve required internal criteria, including implications for ventilation. However, we have not been instructed to assess this aspect.

- Acoustic performance of internal walls and floors, including where relevant adequate sound insulation to protect occupants from disturbance from other areas, and also speech privacy between areas. This is now at a stage where the build ups are largely known, albeit subject to other issues such as fire. As part of this we discuss likely weaknesses such as doors, folding partitions and glazed partitions.

- Criteria for the control of reverberation and other internal acoustic issues.

- Criteria for mechanical services, including where relevant the impact on the various spaces within the development. Note that we have not been instructed to assess the potential impact of external mechanical services on this development or surrounding areas.

3.0 ASSESSMENT STANDARDS

3.1 BS8233

BS 8233 as a whole contains a lot of advice, but section 7 provides a discussion and criteria for different types of building. Extracts are copied below.

The standard provides a useful matrix for establishing suitable sound insulation criteria between adjacent spaces.

Table 3 **Example on-site sound insulation matrix (dB $D_{nT,w}$)**

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms		
		Low sensitivity	Medium sensitivity	Sensitive
Confidential	Very high	47	52	57 [A)]
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57 [A)]
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	57 [A)]
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37

NOTE Background noise can also influence privacy. See also 7.7.6.3.

[A)] $D_{nT,w}$ 55 dB or greater is difficult to obtain on site and room adjacencies requiring these levels should be avoided wherever practical.

It is important to note that the application of the matrix is somewhat subjective and a range of views should be discussed.

3.2 CIBSE Guide

This document includes a lot of advice on noise from mechanical services.

The following is an extract from the CIBSE design guide for noise in building services.

Situation	NR Value
Concert halls, opera halls, studios for sound reproduction, live theatres (>500 seats).	20
Bedrooms in private homes, live theatres (<500 seats), cathedrals and large churches, television studios, large conference and lecture rooms (>50 people).	25
Living rooms in private homes, board rooms, top management offices, conference and lecture rooms (20-50 people), multi-purpose halls, churches (medium and small), libraries, bedrooms in hotels, etc., banqueting rooms, operating theatres, cinemas, hospital private rooms, large courtrooms.	30
Public rooms in hotels, etc., ballrooms, hospital open wards, middle management and small offices, small conference and lecture rooms (<20 people), school classrooms, small courtrooms, museums, libraries, banking halls, small restaurants, cocktail bars, quality shops.	35
Toilets and washrooms, drawing offices, reception areas (offices), halls, corridors, lobbies in hotels, etc., laboratories, recreation rooms, post offices, large restaurants, bars and night clubs, department stores, shops, gymnasia.	40
Kitchens in hotels, hospitals, etc., laundry rooms, computer rooms, accounting machine rooms, cafeteria, canteens, supermarkets, swimming pools, covered garages in hotels, offices, etc., bowling alleys, landscaped offices.	45

The impact of mechanical equipment on surrounding noise sensitive development would normally be assessed using BS 4142 and is currently outside of the scope of this assessment.

4.0 SURVEY DETAILS

We have not been instructed to carry out any site survey work with regards to existing background levels, external noise break-in, or potential impact on other development.

5.0 INTERNAL SOUND TRANSFER

This section refers to the BS 8233 matrix in section 3.1 above.

The matrix effectively has three “axes” – Privacy requirement, Activity noise of the source room, and Noise sensitivity of the receiving room. Its application is inevitably subjective and should be discussed with stakeholders.

5.1 Initial Discussions

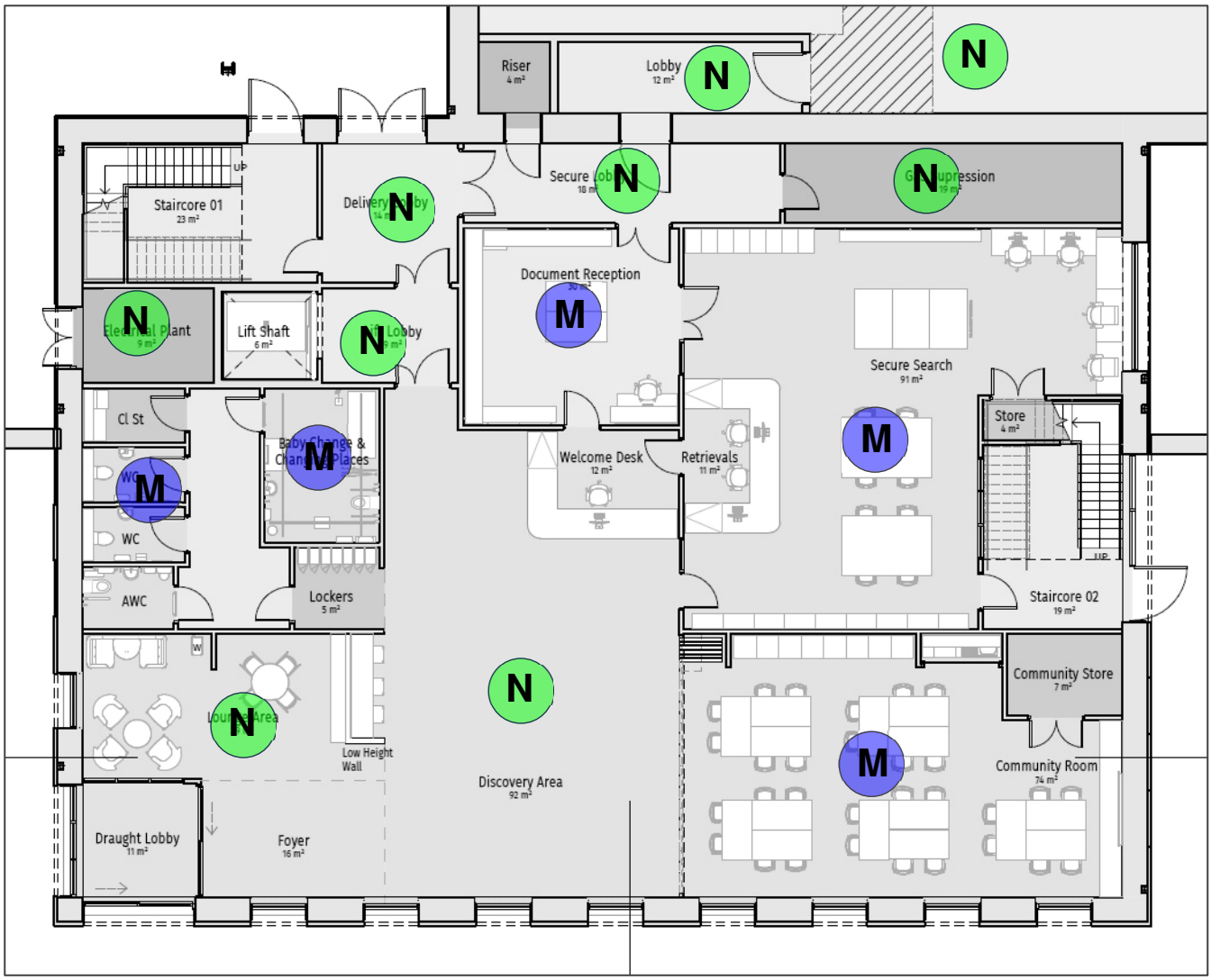
Initial discussions with the client and wider team on 23rd January 2026 were followed by an Initial Overview report, incorrectly dated 10th November 2025 and actually issued on 25th January 2026.

In this conversation it was discussed that there was a desire to have activities and presentations in the entrance areas (Foyer, , Lounge Area, Discovery Area) and the Community Room, but very quiet conditions in the Secure Search area. This is unlikely to be feasible, especially as there are two doors between the Discovery Area and Secure Search. It is inevitable that space/activity management will be required.

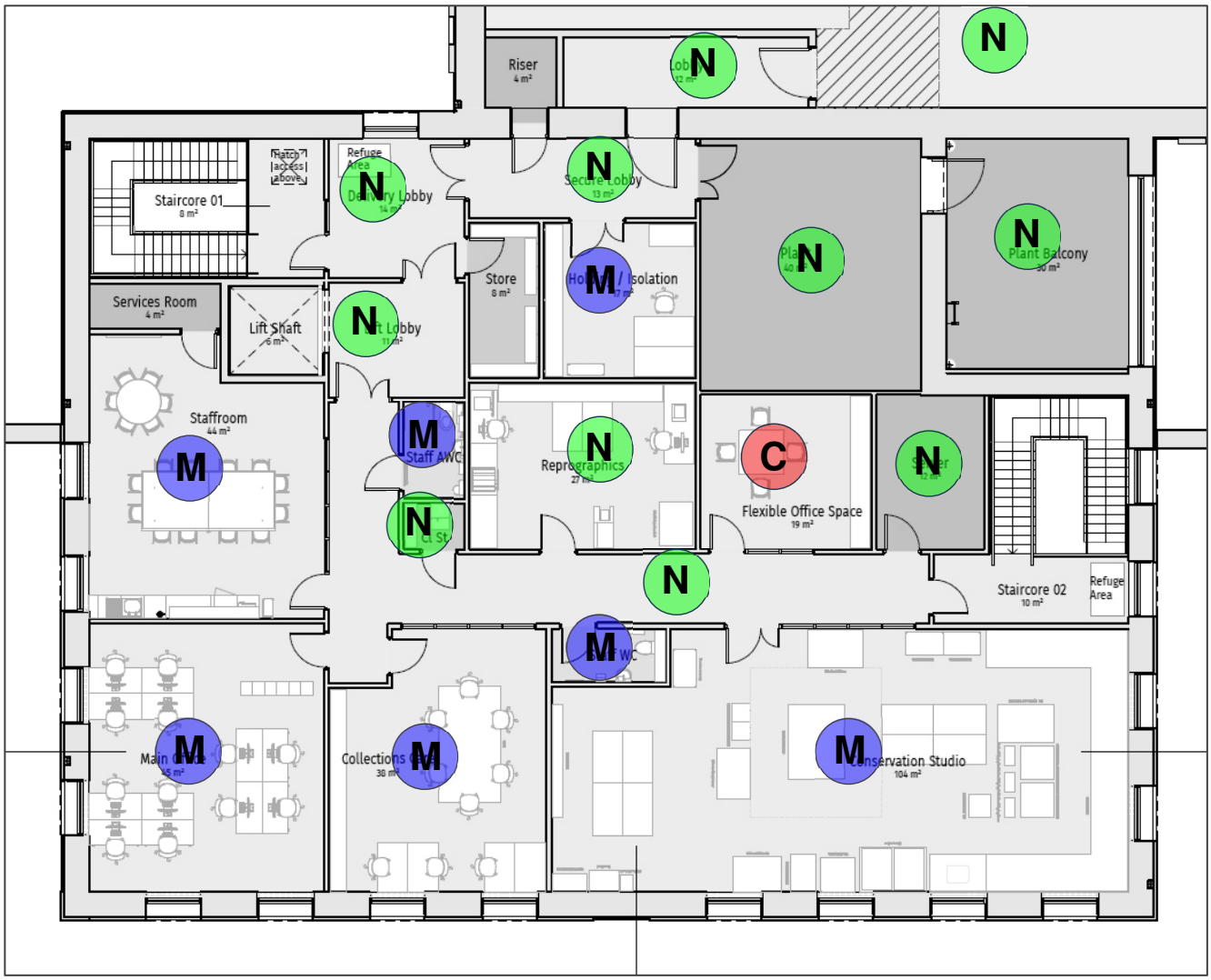
This stage 3 report is based on the development of that discussion and is subject to the upcoming presentation.

5.2 Privacy Requirements

Note that this is separate from sensitivity to noise, and concerns the need for privacy/confidentiality. The requirements are rated as Not Private (**N**), Moderate (**M**), and Confidential (**C**). The following is based on our Initial Overview Report, updated after discussions with the Architect.



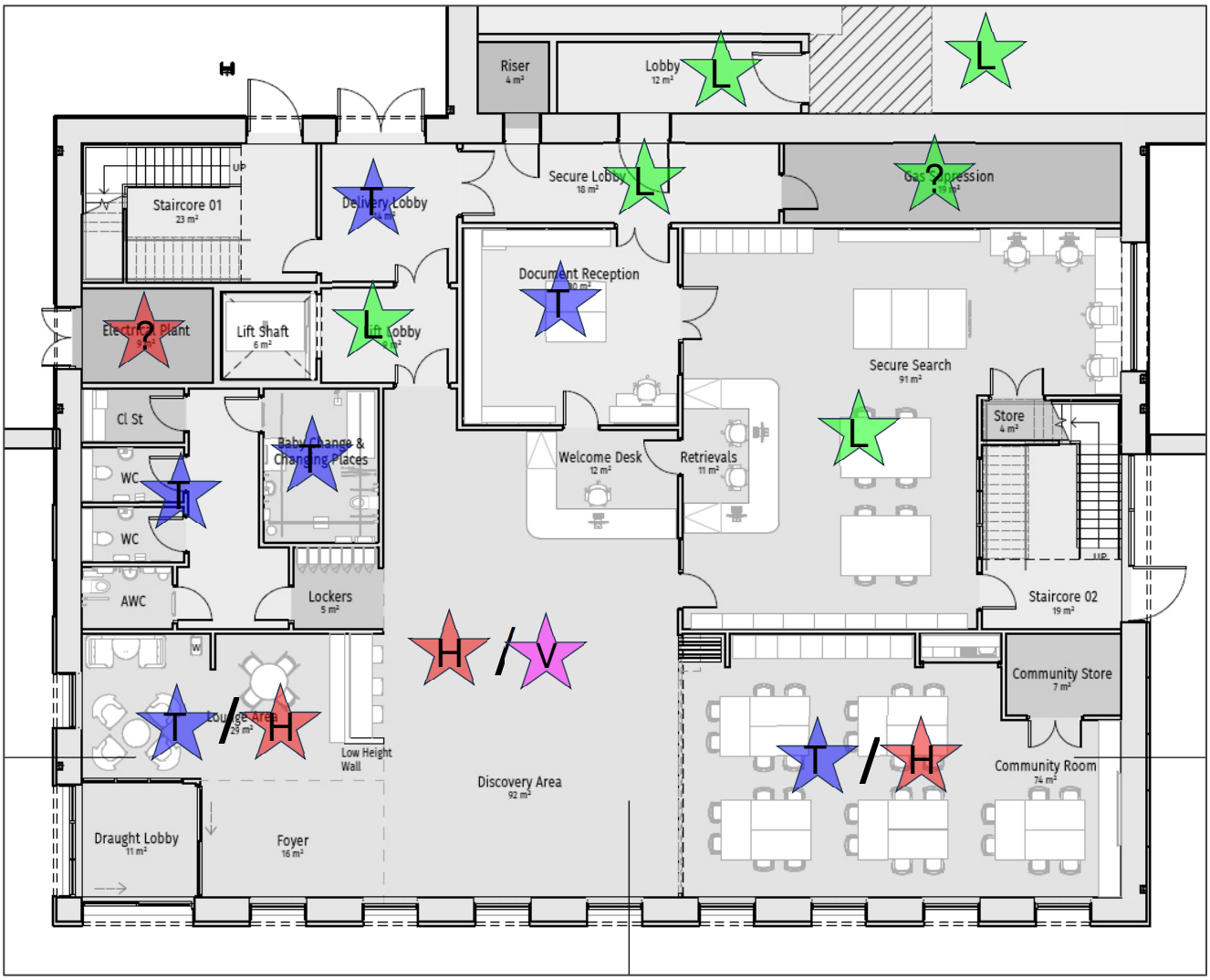
Note that WCs and Baby Change would normally be considered Not Private, but here we have assumed a Moderate level of privacy as they are to be unisex.



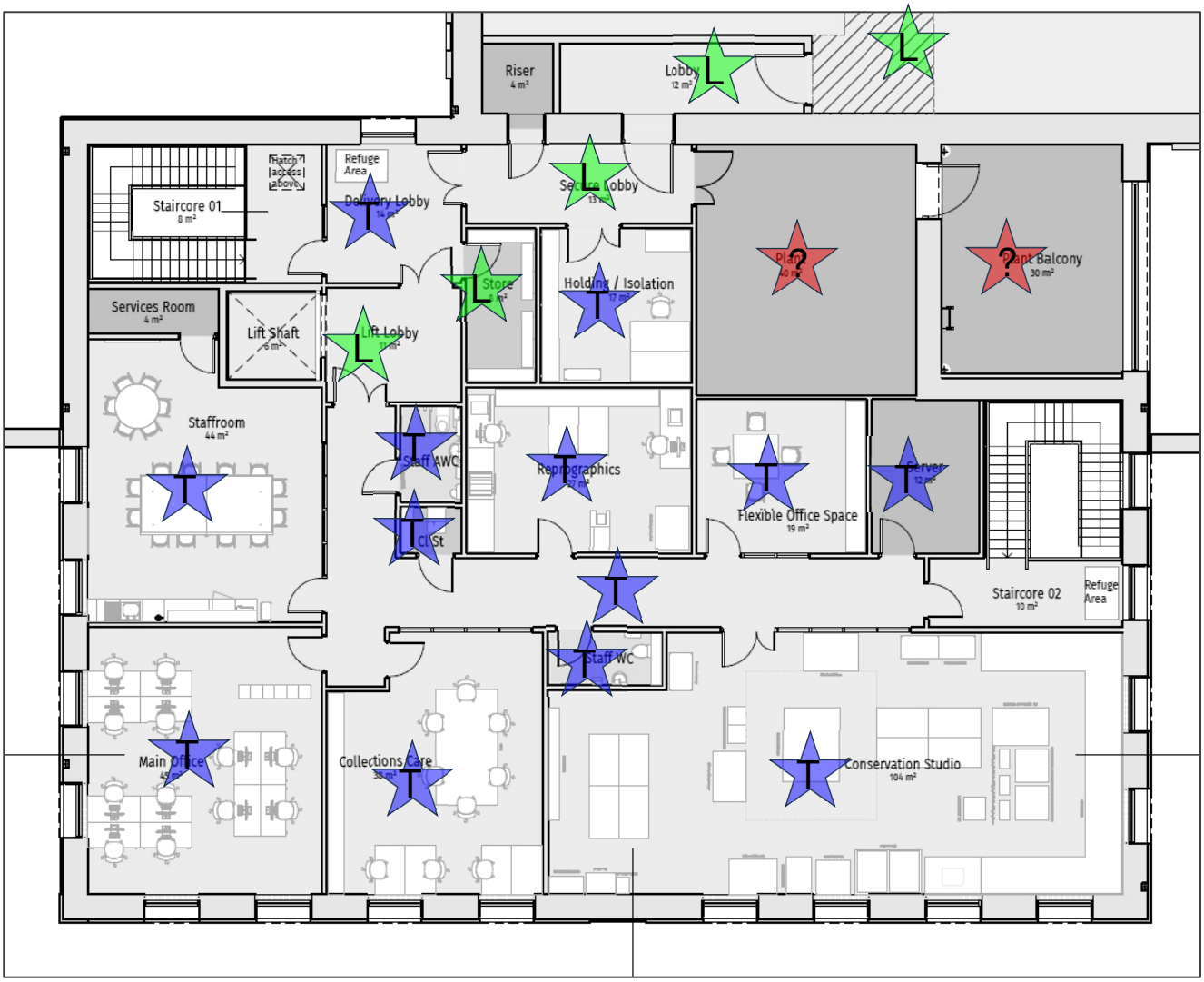
We understand that the Flexible Office Space may be used for private meetings and interviews and so has been designated Confidential.

5.3 Activity Noise of the Source Rooms

With regards to the subjectivity of defining the areas as Low (**L**), Typical (**T**), High (**H**), and Very High (**V**) noise generation areas, we wish to emphasise that this is in the context of what is essentially a library with offices. AV presentations and other more lively events will almost certainly need to be managed in relation to expectation of quiet uses in other areas.

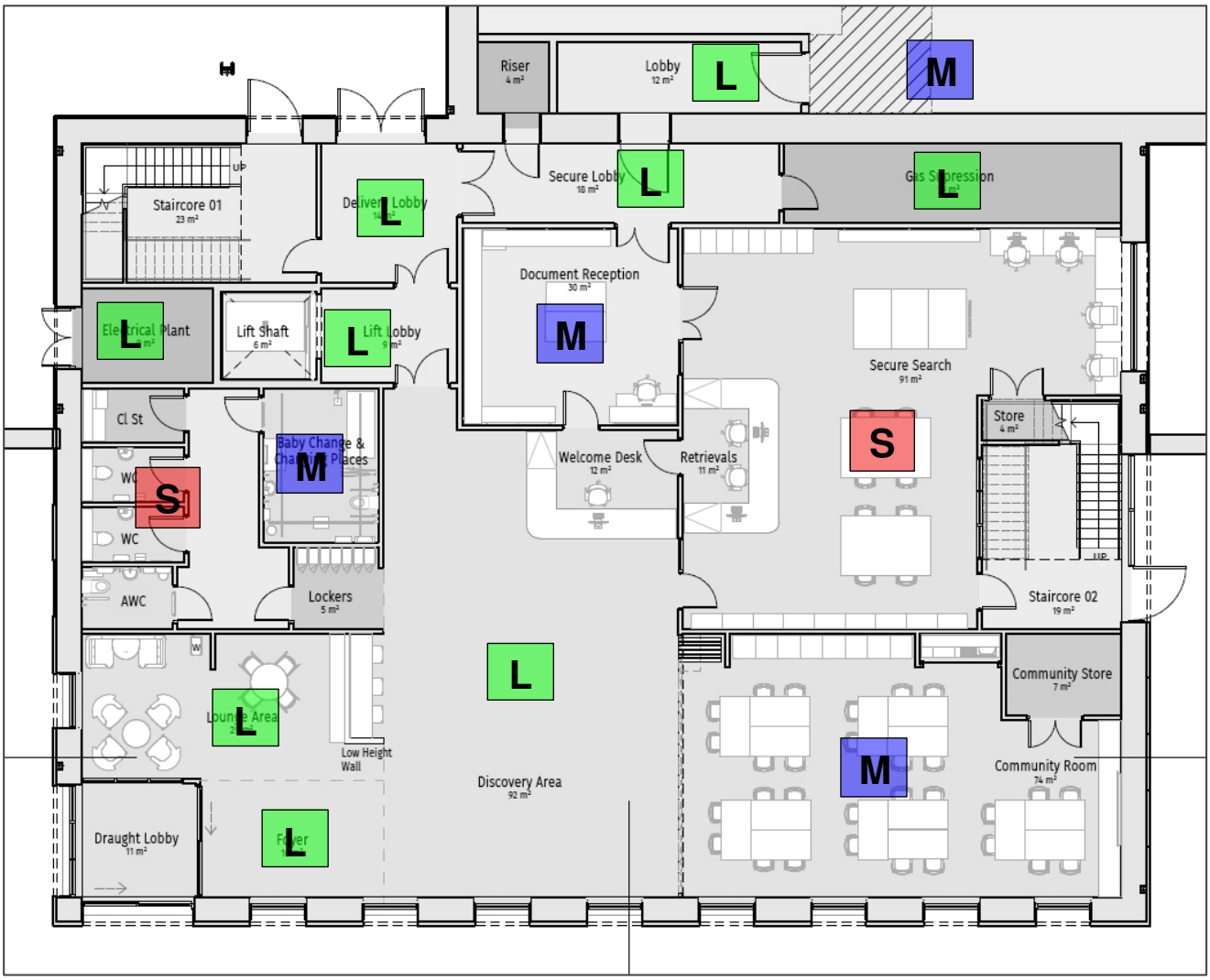


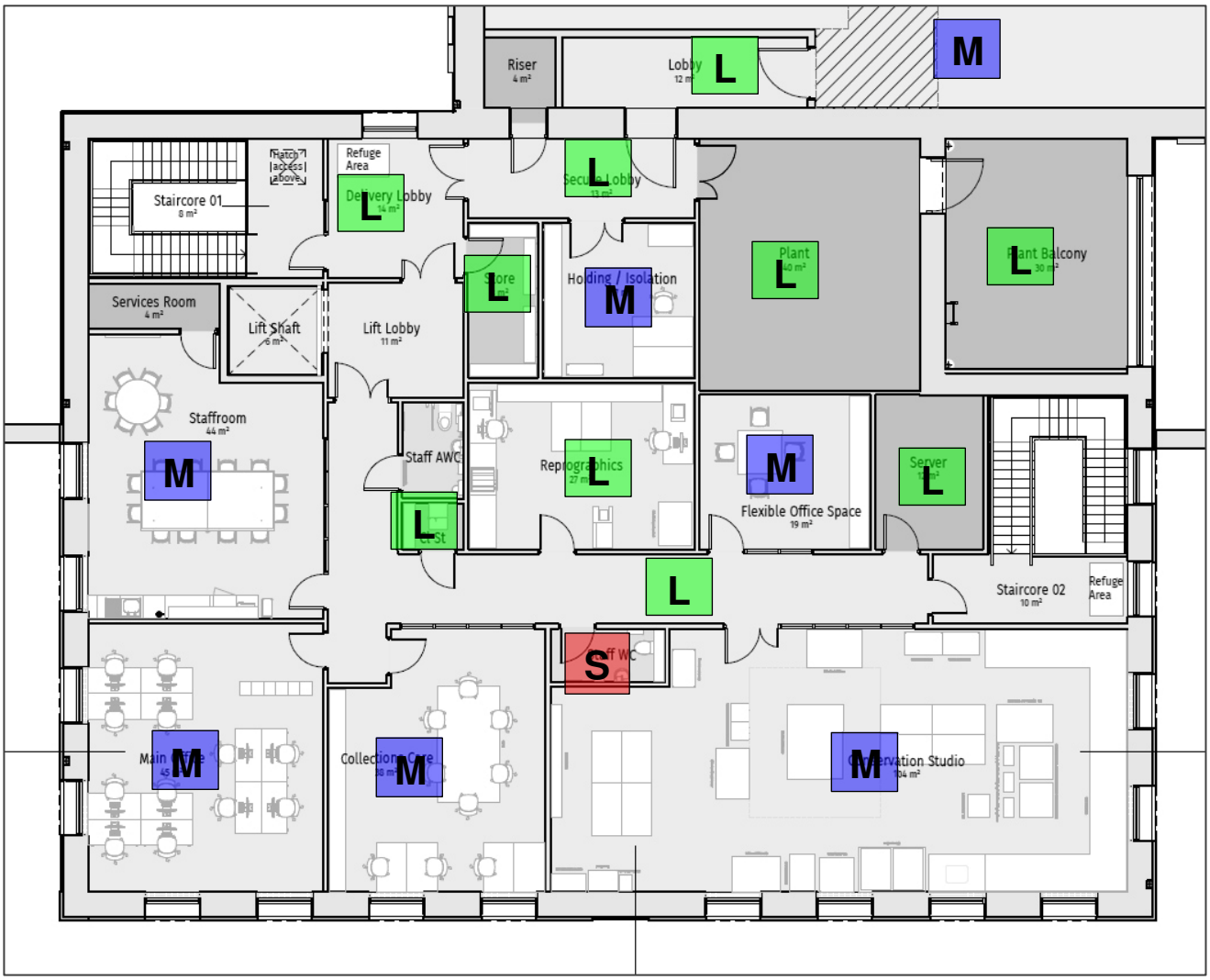
Note that the High to Very High noise generation is based on what we believe was the client request, but this will need to be managed along with expectations for the levels in other areas such as Secure Search.



5.4 Noise Sensitivity of the Receiving Rooms

This is distinct from privacy, and reflects how sensitive the areas are to noise from other areas – Low (**L**), Medium (**M**) and Sensitive(**S**).


Riser
4 m²
Lobby
12 m²
L
M
Secure Lobby
18 m²
L
Gas Suppression
L
Staircore 01
23 m²
Delivery Lobby
L
Document Reception
30 m²
M
Electrical Plant
L
Lift Shaft
6 m²
Lift Lobby
9 m²
L
Secure Search
91 m²
Cl St
Baby Change &
M
Welcome Desk
12 m²
Retrievals
11 m²
S
Store
4 m²
WC
S
WC
AWC
Lockers
5 m²
Staircore 02
19 m²
L
Community Store
7 m²
Lounge Area
L
Low Height
Wall
Discovery Area
92 m²
M
Community Room
74 m²
Draught Lobby
11 m²
Foyer
L



5.5 Separating Walls

The following mark-ups are the result of the above assessments of Privacy Requirements, Activity Noise of Source Rooms, and Noise Sensitivity of Receiver Rooms.

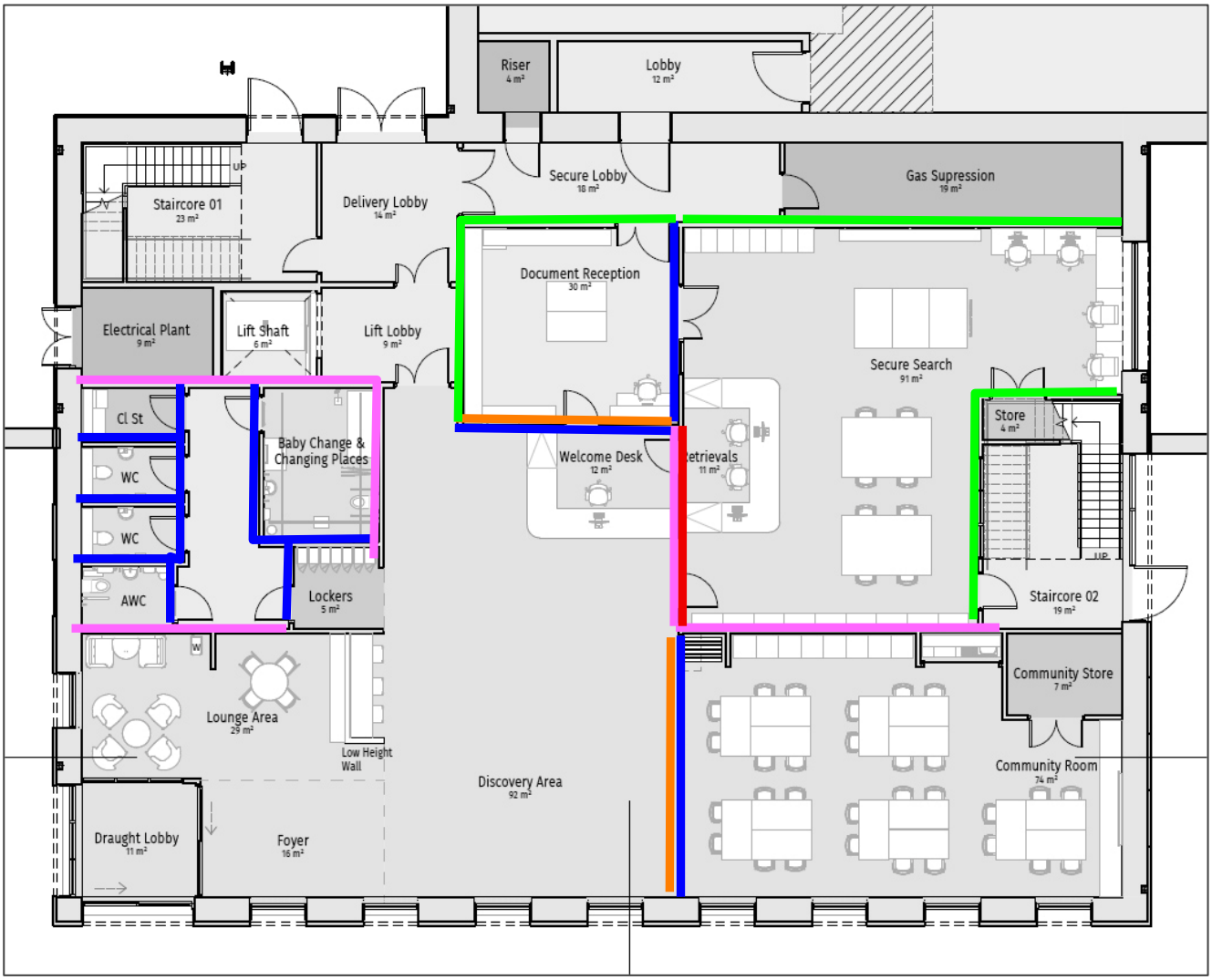
Note that the performance requirements are $D_{nT,w}$ which is an on-site performance. As a rule of thumb, this will typically be at least 6 dB below the R_w value of the laboratory performance quoted by manufacturers.

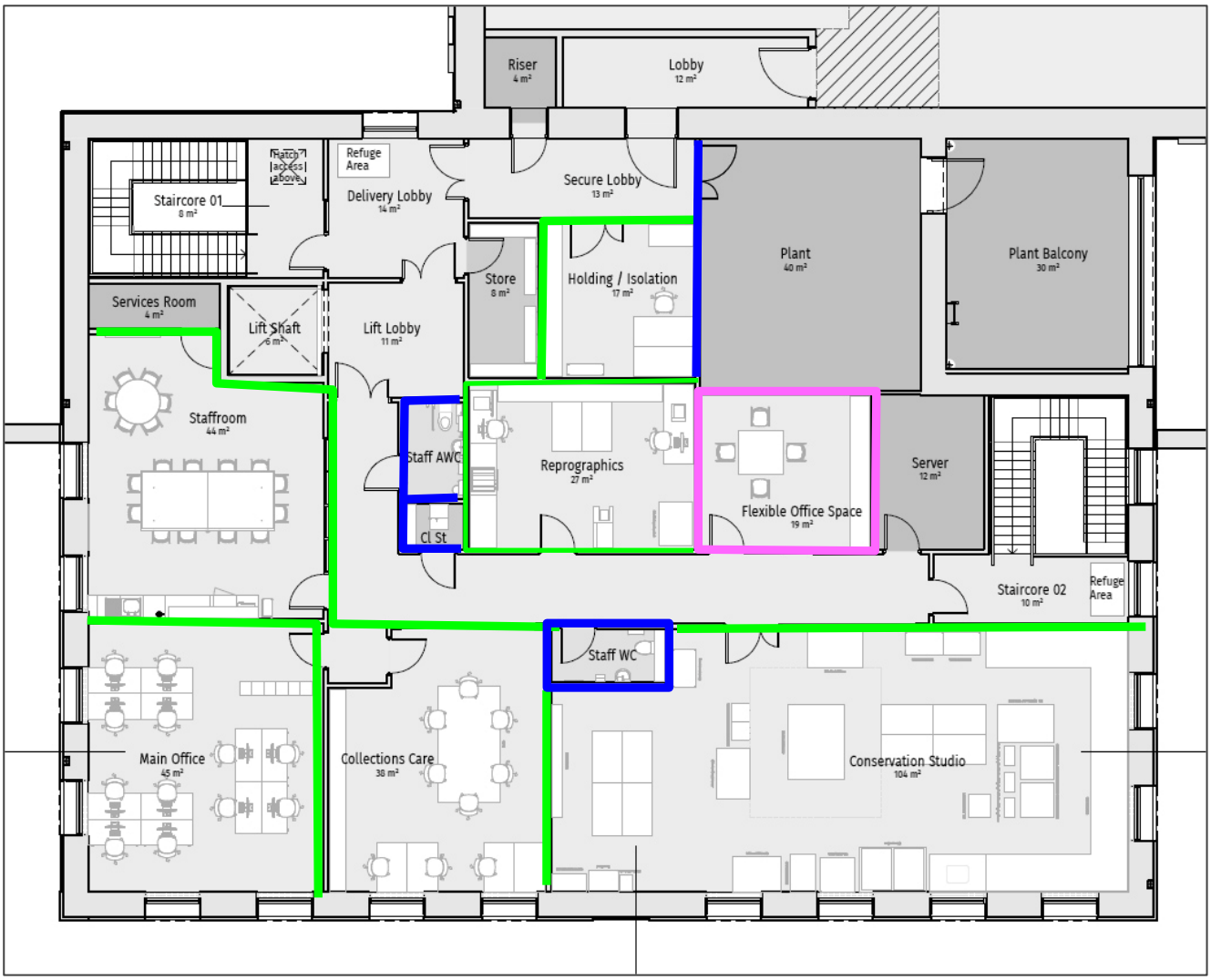
We use the following colour coding:-

	43 $R_w \approx 37$ $D_{nT,w}$
	48 $R_w \approx 42$ $D_{nT,w}$
	53 $R_w \approx 47$ $D_{nT,w}$
	58 $R_w \approx 52$ $D_{nT,w}$
	63 $R_w \approx 57$ $D_{nT,w}$

Colour coding key for all partitions, apart from the operable partition – see below

Where two colours are shown, this represents two options depending on whether the noise generation in the Discovery Area should be considered “High” or “Very High”.





It is important to note that the lower end of the performance recommendations, particularly 43 $R_w \approx 37$ dB $D_{nT,w}$ (green) is not very high, and speech is likely to be clearly audible across partitions – not necessarily intelligible, but certainly likely to be clearly audible. It should be considered as a minimum recommendation.

We understand that the preferred design is based on a 70 mm stud and that the systems provided by Knauf are currently preferred. At the moment, the exact wall build-ups are not yet known and will depend also on structural and fire considerations. The following, therefore, are examples of Knauf systems which meet the acoustic criteria only, and give no consideration at this stage to structural and fire needs.

—— 43 $R_w \approx 37$ $D_{nT,w}$

Knauf Performer: PC-70-055-6-2-12.5-FP-0
Linings: 2 x 12.5 mm Knauf Fire Panel to each side
Cavity Insulation: none
Sound Insulation: 43 R_w

Knauf Performer: PC-70-055-6-1-15-PP-25
Linings: 1 x 15 mm Knauf Performance Plus to each side
Cavity Insulation: 25 mm Knauf Insulation Acoustic Roll
Sound Insulation: 45 R_w

Knauf Performer: PC-70-055-6-1-15-PP-25
Linings: 1 x 15 mm Knauf Performance Plus to each side
Cavity Insulation: 25 mm Knauf Insulation Acoustic Roll
Sound Insulation: 45 R_w

Knauf Performer: PC-70-055-6-2-15-WB-0
Linings: 2 x 15 mm Knauf Wallboard to each side
Cavity Insulation: none
Sound Insulation: 46 R_w

Knauf Performer: PC-70-055-6-1-15-SSP-25
Linings: 1 x 15 mm Knauf Soundshield Plus to each side
Cavity Insulation: 25 mm Knauf Insulation Acoustic Roll
Sound Insulation: 47 R_w

48 $R_w \approx 42\ D_{nT,w}$

Knauf Performer: PC-70-055-6-2-15-SSP-0
Linings: 2 x 15 mm Knauf Soundshield Plus to each side
Cavity Insulation: None
Sound Insulation: 48 R_w

53 $R_w \approx 47\ D_{nT,w}$

Knauf Performer: PC-70-055-6-2-15-WB-25
Linings: 2 x 15 mm Knauf Wallboard to each side.
Cavity Insulation: 25 mm Knauf Insulation Acoustic Roll
Sound Insulation: 54 (R_w

Knauf Performer: PC-70-055-6-2-15-PP-25
Linings: 2 x 15 mm Knauf Performance Plus to each side
Cavity Insulation: 25 mm Knauf Insulation Acoustic Roll
Sound Insulation: 54 R_w

Knauf Performer: PC-70-055-6-2-15-SSP-25
Linings: 2 x 15 mm Knauf Soundshield Plus to each side
Cavity Insulation: 25 mm Knauf Insulation Acoustic Roll
Sound Insulation: 55 R_w

Knauf Performer: PC-92-070-6-2-15-SSP-50
Linings: 2 x 15 mm Knauf Soundshield Plus to each side
Cavity Insulation: 50 mm Knauf Insulation Acoustic Roll
Sound Insulation: 55 R_w

58 $R_w \approx 52\ D_{nT,w}$

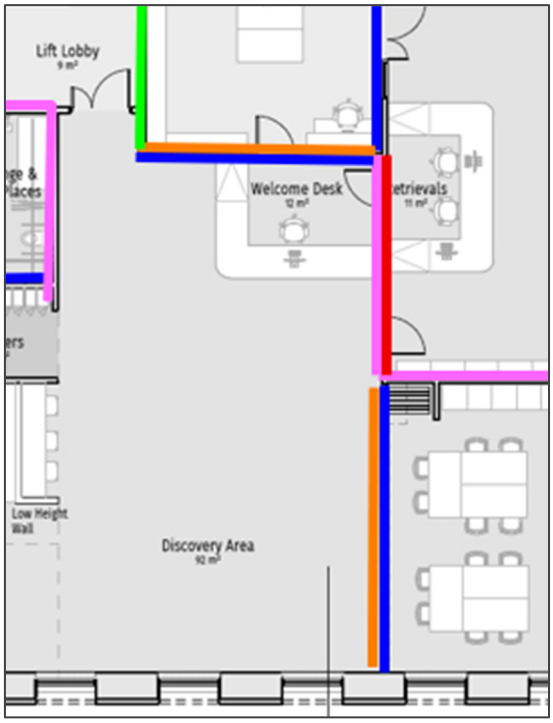
No tested systems available with 70 mm stud. There are examples with larger studs or twin studs, but the discussion below suggests that this might not be worthwhile.

63 $R_w \approx 57\ D_{nT,w}$

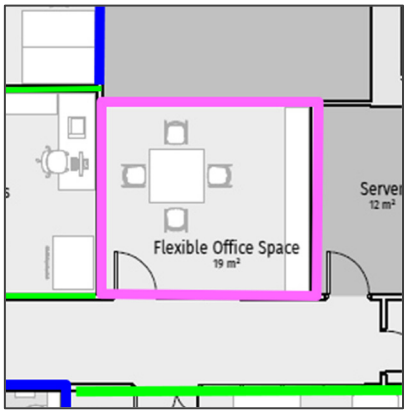
No tested systems available with 70 mm stud. There are examples with larger studs or twin studs, but the discussion below suggests that this might not be worthwhile.

Discussion of Highest Performance Requirements

There are only three instances of the two highest performance requirements (orange and red).



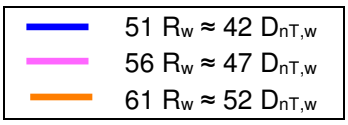
There is also one instance of the next performance requirement (pink) where there is also a door in the partition.



Here we discuss why it is unlikely to be worthwhile trying to achieve these.

1. Discovery Area to Community Room.

   This is almost entirely an operable partition. Operable partitions are notorious for performing worse than the laboratory figures, especially at the higher end. We would suggest that a minimum margin of 9 dB is used to estimate the on-site (D_{nTw} figure). The colour coding key for the operable partitions is therefore more like:-,



Modified colour coding key for operable partition only.

Operable partitions typically come with ratings of up to 59 dB R_w, so the higher end should be good enough for the 56 R_w ≈ 47 dB D_{nTw} (pink) wall type. This falls between the requirement based on "Very High" noise generation in the Discovery Area (orange) and the requirement for "High" noise generation in the Discovery Area (blue). High performance operable partitions can be expensive so this will need to be a judgement call with regards to affordability but, in general we recommend a performance of 51 to 56 R_w.

2. Discovery Area to Secure Search.

The wall has two doors in it which will be significant "weaknesses" in the overall sound insulation. Doors in general are discussed separately below, but the only way to truly match the 63 R_w ≈ 57 dB D_{nTw} (red) wall type is likely to be to use either a lobbied door arrangement or industrial or studio-type doors, as well as substantial treatments to prevent flanking via sidewalls, etc. Even the lesser requirement of the 56 R_w ≈ 47 dB D_{nTw} (pink) wall type, based on "High" noise generation in the Discovery Area, is only likely to be achievable with very high performance doors. Most readily available "acoustic" doors have a performance of up to 35 R_w. These doors combined with the 53 R_w wall, is likely to reduce the overall performance to around 43 R_w, the lowest performance wall in the colour coding key of 5.5 above. Both doors set to a higher of 40 R_w would give an overall combined performance of around 48 R_w, equivalent to the blue performance type. Such doors are likely to be heavy and require greater attention to sealing at edges, including the threshold, and may need to be considered in terms of accessibility.

Working backwards through the matrix in the previous sections, from a 53 R_w partition, with two doors reducing its effective performance to 43 R_w (35 R_w doors) or 48 R_w (40 R_w doors), we arrive at Typical or High noise generation respectively in the Discovery Area.

So, unless the client is prepared to consider very high performance doors or lobby arrangements, there is simply no benefit in a wall spec higher than 53 R_w between the Discovery Area and Secure Search.

In summary, staying with the Secure Search requirement of Moderate privacy and a rating of Sensitive with regards to external noise, the Discovery area will need to be controlled/managed to Typical levels if 35 R_w doors are used, or to High if 40 R_w doors are used. As stated elsewhere, the higher the performance demand on the doors, the greater weight and the greater the emphasise will be on sealing at edges, including the threshold. This should be considered with regards to accessibility.

Note that we do not recommend reducing the wall to anything less than 53 R_w as, combined with the doors, it will be reduced further, but there is no significant benefit in a higher wall specification with the door performances discussed.

On balance we would suggest a 53 R_w partition with 35 R_w door, or 40 R_w door if this can be made practical for accessibility and cost. The client should understand that this is compromise.

3. Discovery Area to Document Reception.

   This also has a door which will form a "weakness". A 35 R_w door, combined with a 53 R_w partition can be expected to provide a combined performance of 46 R_w, which is better than the 43 $R_w \approx 37$ $D_{nT,w}$ (green) performance, but a little less that the 48 $R_w \approx 42$ $D_{nT,w}$ (blue) requirement based on High noise generation in the Discovery Area. To increase the overall performance to R_w 48, the door will need a performance of R_w 38.

   On balance we would suggest a 53 R_w partition with 35 R_w door, but the client should understand that this is compromise.

4. Corridor to Flexible Office Space.

   This was defined as Confidential due to the need for private interviews. However, the partition to the corridor is largely glazed which makes the sound insulation requirement very difficult to achieve. For instance, to provide 50 R_w would require two panes of typical glass with a very large cavity – circa 200mm, or very heavy laminated acoustic glass such as Pilkington Optiphon 9.1+16+13.1 (pane+cavity+pane). Glazed partitions in general are discussed below, but the important point here is that they are normally less of a concern with regards to privacy. As there is a visual connection between the spaces, participants in a private conversation will be aware that there are people outside. For that reason we would suggest that the glazed partition onto the corridor should be or a more practical and budget-friendly specification, and that the other walls to the Flexible Office Space are the full 53 $R_w \approx 47$ $D_{nT,w}$ specification.

   <u>Other Partitions With Doors or Glazing</u>

   Document Reception to Secure Search was discussed at Stage 2. The team was unsure whether to designate Document Reception as a Low or Typical noise generator. It was therefore set as Typical as a worst case. However, the effect of the door will make this difficult. We would suggest that the partition is specified as 53 R_w with 35 R_w doors. This should give an overall wall performance of 43 R_w. It can be increased to 48 R_w with 40 R_w doors if necessary.

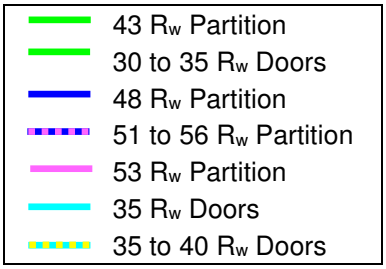
Walls to Toilets are specified as 48 $R_w \approx 42\ D_{nT,w}$ particularly between cubicles as they are unisex. However the doors on the circulation area of the toilets will be inevitable weaknesses for that path.

Offices with Glazed Partitions are unlikely to achieve much more than around 30 to 35 R_w, depending on the proposed build-up. However, see comments above on the effective privacy of glazed partitions with the benefit of being able to see through to the other side.

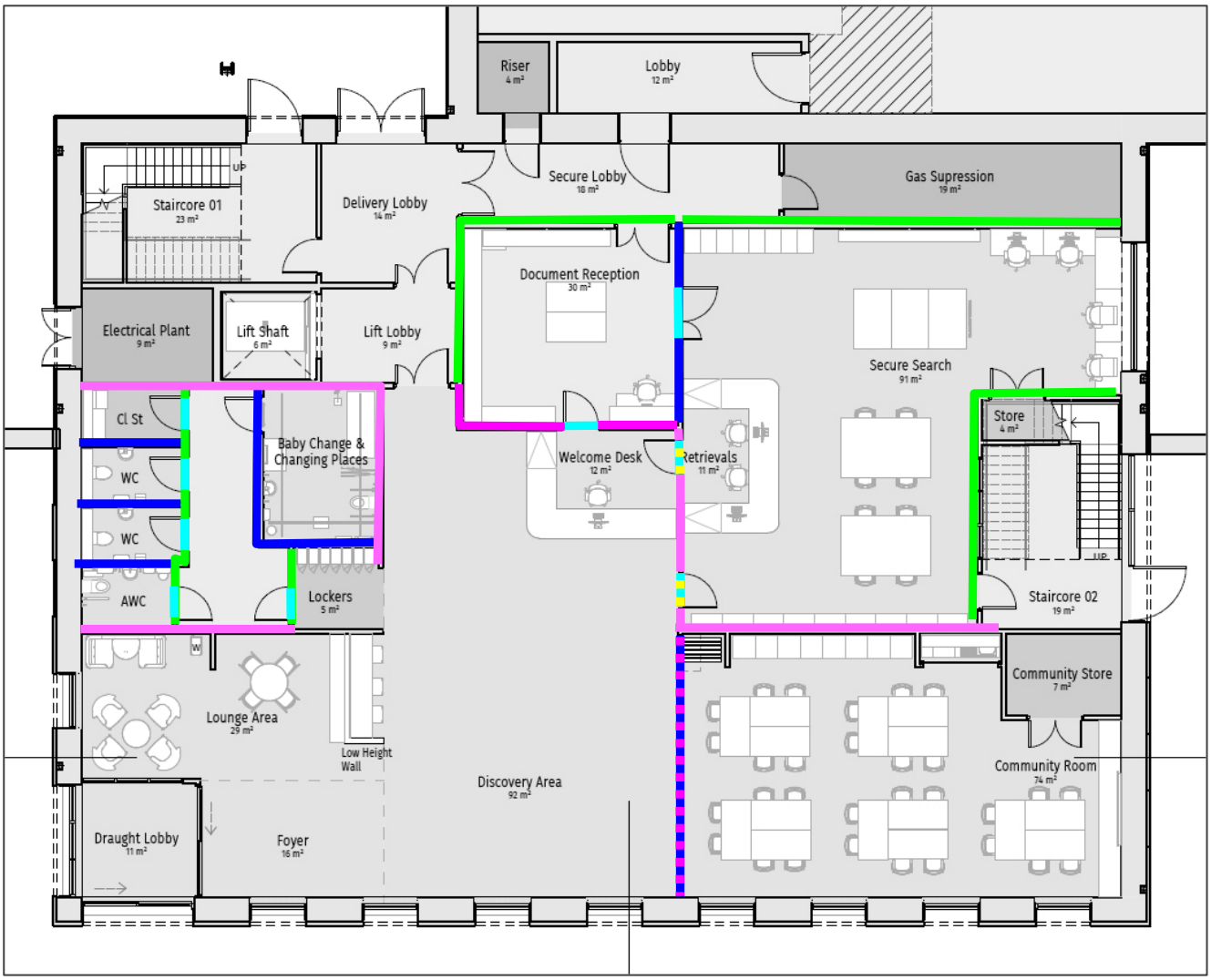
5.6 Revised Mark-Up of Separating Walls

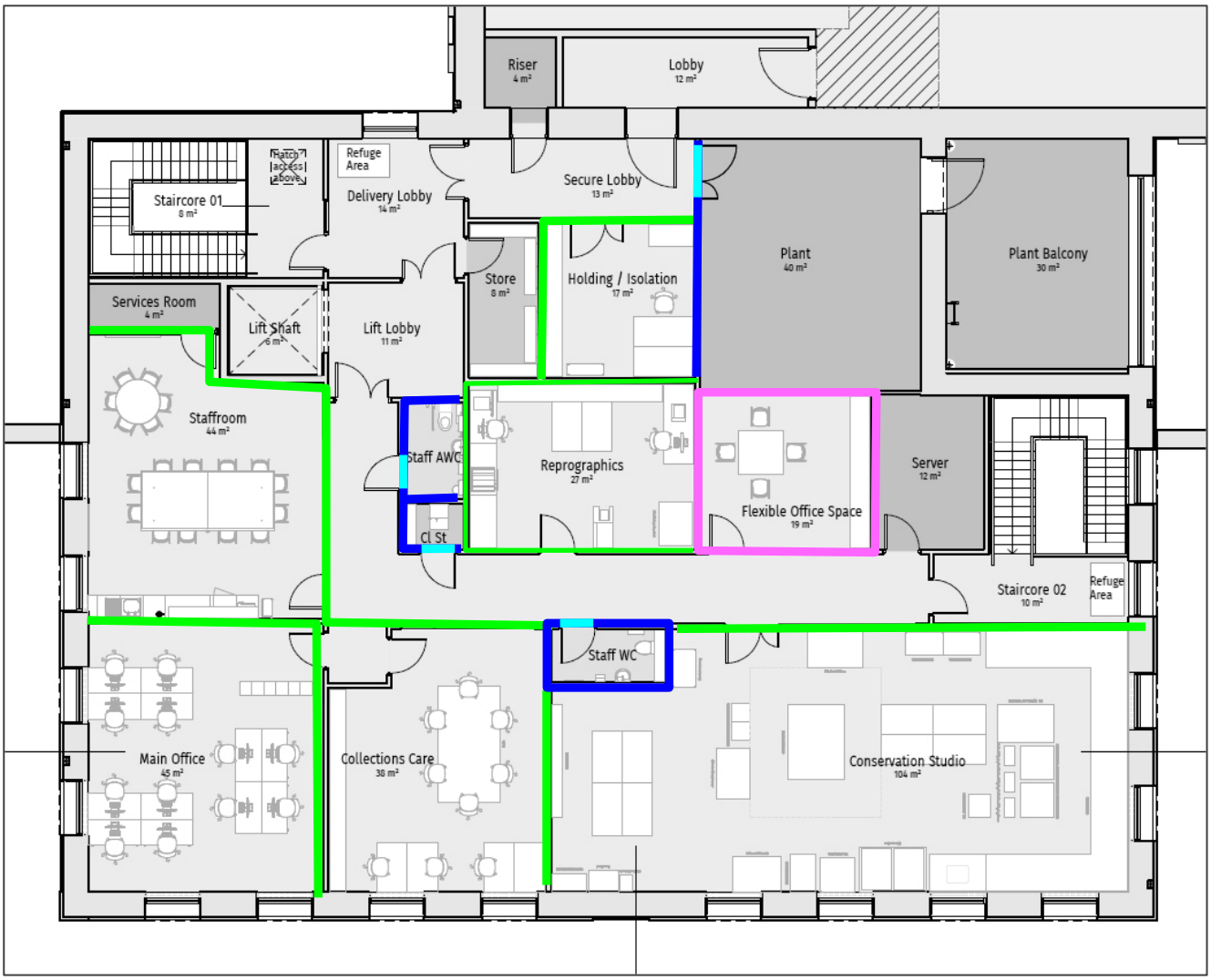
The previous GF and 1F markups revised based on the practicalities of doors. Glazed partitions require further discussion.

We use the following colour coding:-



Colour coding key for all partitions, including doors. Note that glazed partitions require some additional discussion.


Riser
4 m²
Lobby
12 m²
Staircore 01
23 m²
Delivery Lobby
14 m²
Secure Lobby
18 m²
Gas Supression
19 m²
Document Reception
30 m²
Electrical Plant
9 m²
Lift Shaft
6 m²
Lift Lobby
9 m²
Secure Search
91 m²
Store
4 m²
Cl St
WC
WC
AWC
Baby Change & Changing Places
Lockers
5 m²
Welcome Desk
12 m²
Retrievals
11 m²
Staircore 02
19 m²
Community Store
7 m²
Lounge Area
29 m²
Low Height Wall
Discovery Area
92 m²
Community Room
74 m²
Draught Lobby
11 m²
Foyer
16 m²



5.7 Separating Floors

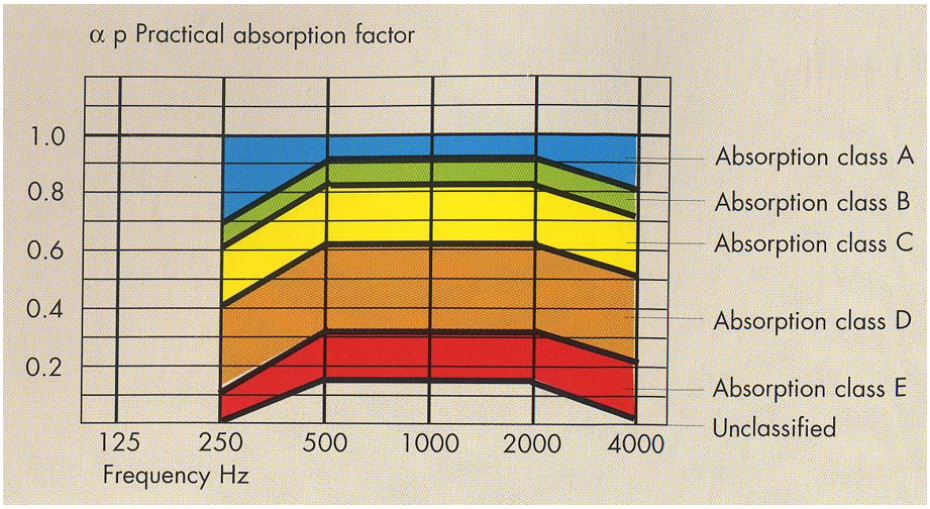
The proposed separating party floors are currently 150mm profiled steel composite deck with an additional 75mm screed, plus 800 mm void and lay-in ceiling grid (in all areas apart from the Discovery area). We were unable to find test data for that exact system but similar buildups suggest a performance of around 60 R_w which is significantly above anything that is likely to be required.

6.0 CONTROL OF REVERBERATION

The control of reverberation within a space is governed by the volume of the space concerned, the amount of absorption present in square metres and the efficiency of the absorbing material used. Acoustic absorbers are rated in efficiency from Class “A” which is the most efficient down to Class “D” which is the least efficient. The amount of surface area of absorption required is governed by the absorption class chosen i.e. a lesser area would be required for a Class “A” absorber than would be needed for a Class “D” absorber.

6.1 Absorber Classes

Classes for acoustic absorption are rated as shown below:



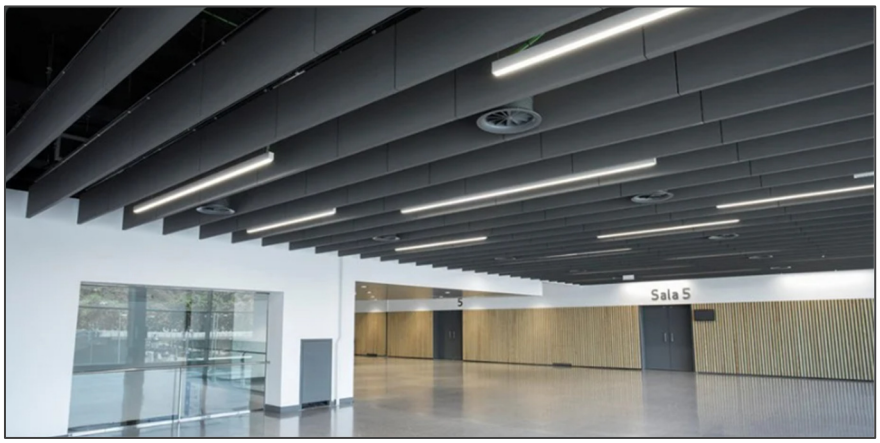
6.1 Design Approach

A suitable design strategy for absorption would be as per BB93:- Guidance for the Acoustic Design for Schools and is recommended as the basis of the strategy for the control of Reverberation Times for this project.

For general meeting rooms, absorption is likely to be provided in the form of acoustic ceiling tiles.

For larger areas such as the Discovery Area, where is it currently proposed to keep the soffit exposed, absorption can be added in the form of absorbent panels and hanging baffles.

Example of acoustic hanging baffles below:



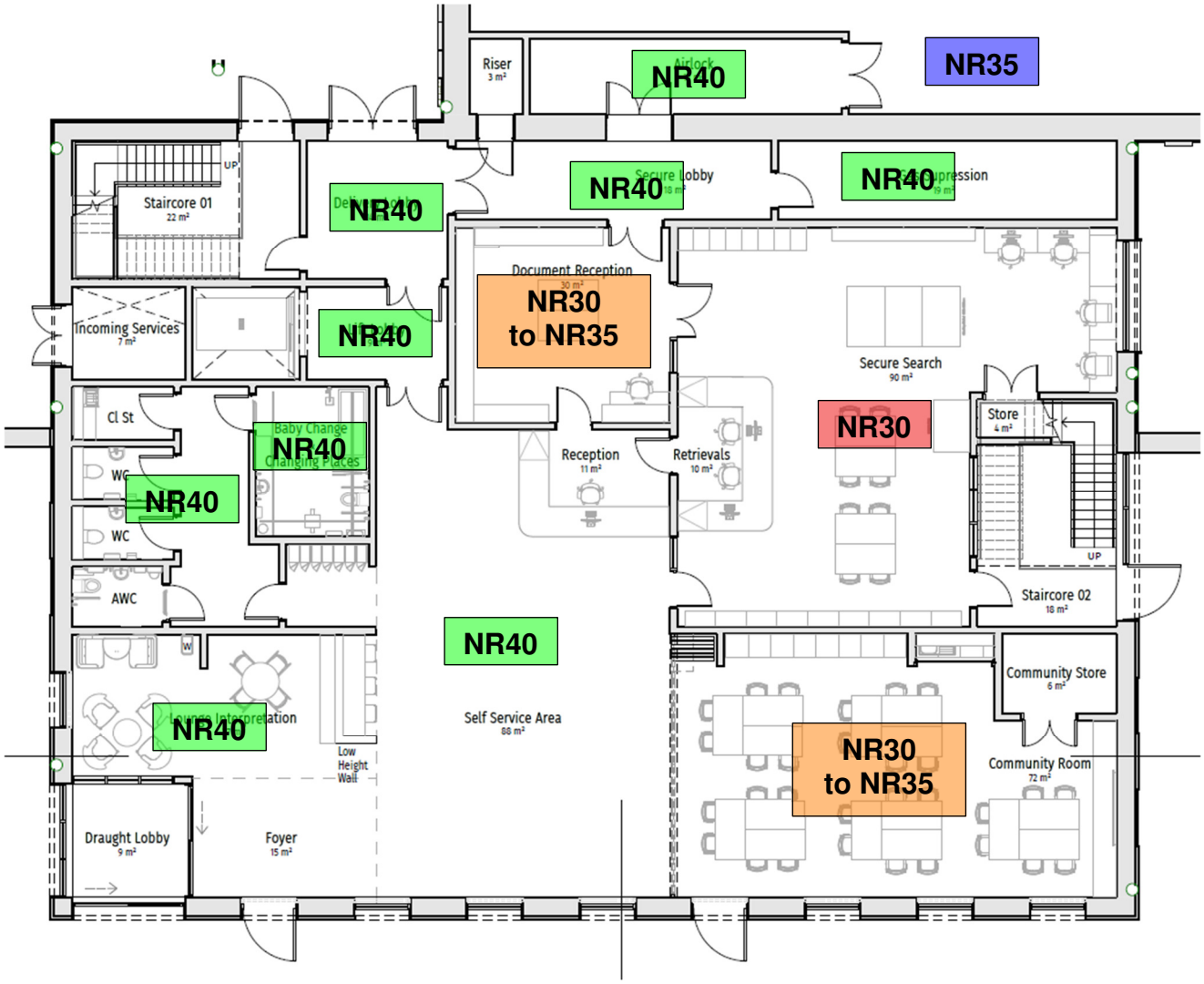
The exact area and positioning of absorption required for each individual space will depend upon the absorption class of the chosen end product. However a useful rule of thumb to work to would be an area of Class A absorption equivalent to 80% of the floor area of the space concerned. Class B absorbers equivalent to 90% of the floor area will give the same performance. There is larger range of performance for Class C absorbers and the middle of this range at 100% of the floor area will give

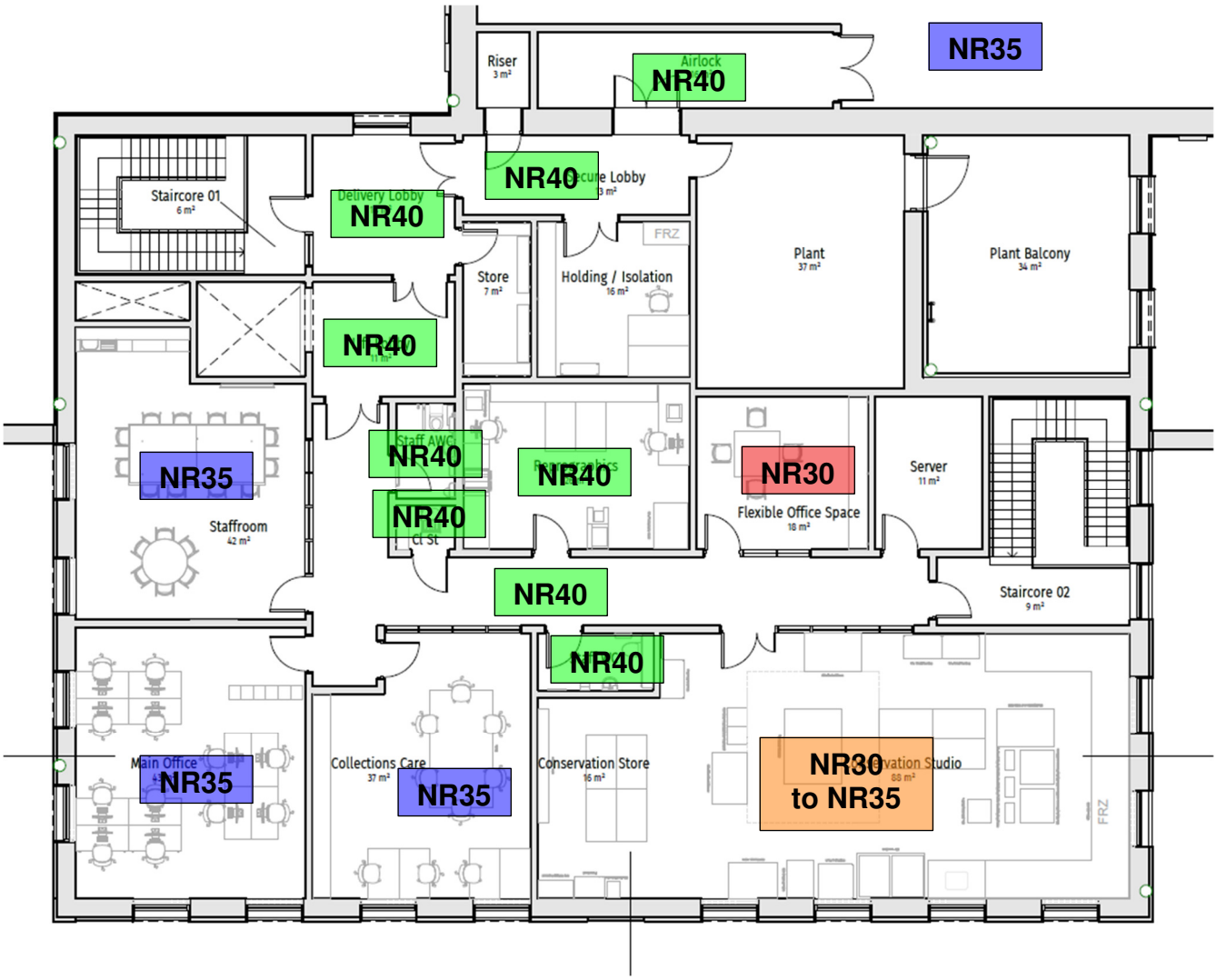
the same performance. The bottom of the Class C range will provide a little less absorption, but unlikely to be a problem in spaces which are not too sensitive.

7.0 MECHANICAL SERVICES

We have not been instructed with regards to the potential impact of mechanical equipment on surrounding noise sensitive uses. This section deals only with the mechanical equipment impact on the internal spaces.

The following are the internal noise criteria, based on CIBSE guidance.





8.0 GENERAL AND MISCELLANEOUS COMMENTS

Separating Wall Assumptions

Note that the sound insulation examples are based on full height separating walls, ie. from slab to slab. Future proofing may need to be discussed in due course if there is a likely to be a future need to move them. Design can be made for walls to the ceiling level but they will have significant implications for ceiling specifications and void treatments.

Doors

Doors will be the weak points in any party wall. Where reasonable sound insulation is required, they will need to seal all round, including the bottom edge. This should be borne in mind with accessibility issues.

A fairly basic acoustic door of 44 mm solid core timber can only be relied upon to provide around 30 dB R_w. This is usually found to be adequate for general office spaces and, on balance, this is what we recommend for all 43 R_w partitions. A higher performance 54 mm timber door should provide around 35 dB R_w and the client can take an informed view as to whether such an upgrade is desirable on 43 R_w partitions. Where these are recommended, they are shown in the above mark-ups.

Higher spec doors can reach 40 dB R_w. These are recommended for the two Discovery Area to Secure Search doors albeit as a compromise between performance and practicality. It is important that the client understands that the only realistic way to achieve the their ideal wishes for high or very high levels in the Discovery Area and low levels in the Secure Search is to rearrange things so that there can be a lobby arrangement for the public and behind the reception desk. Very high performance single doors are unlikely to be practical.

Glazed Partitions

Most straight forward glazed partitions and doors will not meet the recommended performance. Users often do not mind this as there is a visual connection between the spaces (so, for instance, participants in a private conversation will be aware that there are people outside), but the client needs to understand this. Higher spec partitions can of course be designed if necessary.

Absorption

Further to the general section on reverberation above, it is worth considering maximising the amount of absorption in areas where there is likely to be a lot of noise generation, such as the various entrance areas. We understand that they are to be carpeted, which is a good starting point. However we recommend that as much absorption as possible is used in these areas as it will usually have an effect of making people instinctively speak more quietly.

Privacy

Privacy is not just a function of sound insulation. Often higher noise levels on the receiver side, such as the corridor outside the Flexible Office, will improve privacy. On that basis, it is often advised that the mechanical services are not set to be too quiet in areas where low noise levels are not necessarily required. For instance the corridor outside of the Flexible Office Space should meet the basic criterion for a corridor, but should not give a safety margin which will render it be too quiet and reduce privacy.

Hand Dryers

Hand Dryers, are a further consideration in terms of the activity levels in toilets. It is important that mounting on important separating walls is avoided and, in most cases, resilient mounting is also recommended.

Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but is really should be stated. The threshold of human hearing is a sound pressure of 20μPa or a sound power of 1pW.

A sound pressure level or SPL should be expressed in dB(re. 20μPa). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to give an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted levels are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

NR and NC Levels

NR curves and NC curves are a series of curves representing noise levels across the frequency range. A given noise climate has an NR level or NC level if it equals a point on the curve at any frequency. They are particularly, although by no means exclusively, used as a means of specifying noise limits in an indoor environment, for instance from mechanical services or traffic noise break-in from the outside. They are typically expressed as NR or NC followed by a number, e.g. NR40, NC55, etc.

Equivalent Continuous Sound Level, L_{eq}

This can be simplistically described as a way of expressing the average noise level.

The unit is dB L_{eq}. For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq}.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max}. For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax}.

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceed for a percentage of the time. L_n is the index representing the level exceeded for n% of the measurement period.

The unit is dB L_n. For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{An}.

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceeded for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band from low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq}, L_{max}, L_n, etc. as defined above.

Sound Insulation

Sound insulation is best expressed across the frequency range in octave bands or third octave bands. Often, however, in known environments such as domestic sound insulation and speech privacy, it is simpler to express the sound insulation as a single figure. A higher value means better sound insulation.

The most common ways are dB D_{nTw}, dB R_w and dB$_{(mean\ 100\text{-}3150Hz)}$. The first two are ways of expressing average sound insulation, weighted to account for speech frequencies. The third is simply an un-weighted mean value.

The Building Regulations Approved Document E (ADE) routinely refer to D_{nTw} $+C_{tr}$. The C_{tr} term is a negative number which is used to modify the D_{nTw} value for the insulation properties at lower frequencies.

ADE also uses the L_{nTw} index for impact sound transmission. It is a measure of the level of noise in the room below a room in which a standard tapping machine is being used. It represents the impact sound transfer such as footfall noise, scraping chairs, washing machines, etc. A lower value means better insulation.

Reverberation Time

The most common measure of Reverberation Time is, effectively the time taken for sound from a steady source to decay by 60 dB after it has been abruptly cut off. In practice it is often difficult to measure a 60 dB decay and so decays of 30 dB, 20 dB, or even 10 dB are often used and adjusted pro rata, although the exact measure is not quite the same.

Reverberation Time is generally expressed as RT in seconds. We may, if we are being precise, add subscripts 60, 30, etc to show whether the basis of the measure is 60 dB decay, 30 dB decay, etc. E.g. the RT_{60} = 0.52s, the RT_{30} = 0.49s, etc.

RT can be expressed in octave bands or 1/3 octave bands across the frequency range, or at central frequencies such as 500 Hz or 1kHz.