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Ventilation Calculations

For

Camden Hostels, Chester Road

On behalf of

MORGAN SINDALL

DOCUMENT NUMBER: 123007-AGL-CH-XX-CA-M-0001					
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Project Name	Chester Road
Project No.	LE0271
Title	ESP Calculations.xlsx
Date:	02/11/2023
By	LA
QA'd By	

External Static Pressure Calculations

Apartment	Ductwork Pressure Losses (Index Run)	Total Bend Pressure Losses	Attenuator Pressure Loss (Index Run)	Louvre / Air Brick Pressure Loss	Ceiling Grille Pressure Loss	Total ESP	10% Margin
Pressure Loss (Pa)						0	0.0
Wheelchair Type Apartment	10.9	18.4		8.5	11	48.8	53.7
Studio Type Apartment	8.7	17.5		9	13.5	48.7	53.6
1Bed Type Apartment	8.7	14.75		11	5.5	40.0	44.0
2 Bed (Special) Apartment	14.7	24.25		11	5.5	55.4	60.9
2 Bed Type Apartment	13.7	24.9		15	3.5	57.1	62.8

Wheelchair Type

Index Run - Wheelchair Unit

Index Run Ductwork Section	Duct Size	Air Flow Rate (l/s)	Duct Length (m)	Pressure Loss / metre (Pa/m)	Pressure Loss (Pa)
Section 1	204x60	11	0.59	0.4	0.2
Section 2	204x60	11	2.5	0.4	1.0
Section 3	204x60	22	1.5	1.2	1.8
Section 4	204x60	22	1.4	1.2	1.7
Section 5	204x60	22	0.33	1.2	0.4
Section 6	204x60	22	0.35	1.2	0.4
Section 7	204x60	22	4.5	1.2	5.4
				TOTAL	10.9 Pa

Bends - Wheelchair Unit

Bend	Air Flow Rate (l/s)	Pressure Loss (Pa)
1	11	0.5 Pa
T-Piece - 2	22	0.8 Pa
3	22	3.6 Pa
4	22	3.6 Pa
5	22	3.6 Pa
Transition	22	1.2 Pa
Transition	22	1.2 Pa
Spigot 125ø	22	3.9 Pa
	TOTAL	**18.4 Pa**

Studio Type Apartment

Index Run - Studio Apartment

Index Run Ductwork Section	Duct Size	Air Flow Rate (l/s)	Duct Length (m)	Pressure Loss / metre (Pa/m)	Pressure Loss (Pa)
Section 1	204x60	21	3.5	1.2	4.2
Section 2	204x60	21	0.28	1.2	0.3
Section 3	204x60	21	0.47	1.2	0.6
Section 4	204x60	21	0.47	1.2	0.6
Section 5	204x60	21	0.42	1.2	0.5
Section 6	204x60	21	2.1	1.2	2.5
				TOTAL	8.7 Pa

Bends - Studio Apartment

Bend	Air Flow Rate (l/s)	Pressure Loss (Pa)
1	21	3 Pa
2	21	3 Pa
3	21	3 Pa
4	21	3 Pa
Transition	21	1.2 Pa
Transition	21	1.2 Pa
Spigot 125ø	21	3.1 Pa
	TOTAL	**17.5 Pa**

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1 Bed Type Apartment

Index Run Ductwork Section	Duct Size	Air Flow Rate (l/s)	Duct Length (m)	Pressure Loss / metre (Pa/m)	Pressure Loss (Pa)
Section 1	204x60	13	1.8	0.4	0.7
Section 2	204x60	26	4	1.3	5.2
Section 3	204x60	26	0.15	1.3	0.2
Section 4	204x60	26	0.4	1.3	0.5
Section 5	204x60	26	1.6	1.3	2.1
				TOTAL	8.7 Pa

Bends - 1 Bed

Bend	Air Flow Rate (l/s)	Pressure Loss (Pa)
T-Piece - 1	13	0.4 Pa
2	26	4.5 Pa
3	26	4.5 Pa
Transition	26	1.6 Pa
Transition	26	1.6 Pa
Spigot 125ø	26	2.15 Pa
	TOTAL	**14.75 Pa**

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2 Bed (Special) Type Apartment

Index Run - 2 Bed (Special)

Index Run Ductwork Section	Duct Size	Air Flow Rate (l/s)	Duct Length (m)	Pressure Loss / metre (Pa/m)	Pressure Loss (Pa)
Section 1	204x60	13	4.2	0.4	1.7
Section 2	204x60	26	3	1.3	3.9
Section 3	204x60	26	1.5	1.3	2.0
Section 4	204x60	26	0.45	1.3	0.6
Section 5	204x60	26	4	1.3	5.2
Section 6	204x60	26	0.45	1.3	0.6
Section 7	204x60	26	0.58	1.3	0.8
				TOTAL	14.7

Bends - 2 Bed (Special)

Bend	Air Flow Rate (l/s)	Pressure Loss (Pa)
T-Piece - 1	13	0.9 Pa
2	26	4.5 Pa
3	26	4.5 Pa
4	26	4.5 Pa
5	26	4.5 Pa
Transition	26	1.6 Pa
Transition	26	1.6 Pa
Spigot 125ø	26	2.15 Pa
	TOTAL	**24.25 Pa**

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2 Bed Type Apartment

Index Run - 2 Bed Type Apartment

Index Run Ductwork Section	Duct Size	Air Flow Rate (l/s)	Duct Length (m)	Pressure Loss / metre (Pa/m)	Pressure Loss (Pa)
Section 1	204x60	10	0.24	0.3	0.1
Section 2	204x60	10	2.7	0.3	0.8
Section 3	204x60	20	2.5	0.8	2.0
Section 4	204x60	30	2.8	1.6	4.5
Section 5	204x60	30	0.46	1.6	0.7
Section 6	204x60	30	0.59	1.6	0.9
Section 7	204x60	30	2.9	1.6	4.6
				TOTAL	13.7

Bends - 2 Bed Type Apartment

Bend	Air Flow Rate (l/s)	Pressure Loss (Pa)
1	10	0.9 Pa
T Bend - 2	20	0.6 Pa
T Bend - 3	30	5.3 Pa
4	30	6.3
5	30	6.3 Pa
Transition	30	1.2 Pa
Transition	30	1.2 Pa
Spigot 125ø	30	3.1 Pa
	TOTAL	**24.9 Pa**

Chester Road
New Dwelling Ventilation Rates

Continuous Extract Rates
Part F Table 1.2

Ref	Kitchen	Bathroom	En-suite	Utility	Total l/s
1 Bed unit	1	1	0	0	21
Studio	1	1	0	0	21
2 Bed unit	1	1	1	0	29
2 Bed Unit G C8-C9	1	1	0	0	21
Wheelchair Unit 1	1	1	0	0	21
Wheelchair Unit 2	1	1	0	0	21

Whole Dwelling Ventilation Rates
Part F Table 1.3

Ref	No. of Bedrooms	Total l/s
1 Bed unit	2	25
Studio	1	19
2 Bed unit	2	25
2 Bed Unit G C8-C9	2	25
Wheelchair Unit 1	1	19
Wheelchair Unit 2	1	25

Minimum Ventilation Rate
Part F Clause 1.24a

Ref	Area	Total l/s
1 Bed unit	37.35	11
Studio	26.32	8
2 Bed unit	54.48	16
2 Bed Unit G C8-C9	37.86	11
Wheelchair Unit 1	57.44	17
Wheelchair Unit 2	58	17

Extract Ventilation rates

Kitchen	13 l/s
Bathroom	8 l/s
En-suite	8 l/s
Utility	8 l/s

Table 1.2 Minimum extract ventilation rates for continuous extract systems[1]

Room	High rate (l/s)	Continuous rate
Kitchen	13	The sum of all extract ventilation in the dwelling on its continuous rate should be at least the whole dwelling ventilation rate given in Table 1.3
Utility room	8	
Bathroom	8	
Sanitary accommodation	6	

NOTE:
1. If the continuous rate of ventilation provided in a room is equal to or higher than the minimum high rate specified in the table, no extra ventilation is needed.

Table 1.3 Minimum whole dwelling ventilation rates determined by the number of bedrooms

Number of bedrooms[1][2]	Minimum ventilation rate by number of bedrooms (l/s)
1	19
2	25
3	31
4	37
5	43

NOTES:
1. If the dwelling only has one habitable room, a minimum ventilation rate of 13l/s should be used.
2. For each additional bedroom, add 6l/s to the values in Table 1.3.

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Supply duct sizing - Supply

Section	Duct type	Flow rate (m^3/s)	Size (mm)	Velocity (m/s)	Length (m)	Pressure drop (N/m^2)
1	Spiral	0.076	200	2.42	7.3	39.72
2	Spiral	0.028	125	2.28	1.55	16.21
3	Spiral	0.048	150	2.72	1.84	6.47
4	Spiral	0.016	100	2.04	0.85	14.76
5	Spiral	0.032	150	1.81	3.53	12.85

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Duct system HRU02 : index run

System resistance	60.96	N/m²
Total flow rate	0.076	m³/s
Index run to outlet	S2	
on floor	0	

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Supply duct damper losses - Supply

Section	Available pressure	Required pressure	Additional loss required (N/m²)	Damper specified
2	21.23	16.21	5.02	No
5	14.76	12.85	1.91	No

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Ductwork quantities, supply system : Supply

Component type	Description	Size mm	Quantity
Tee	Spiral Standard tee	200 : 125 : 150	1
Adaptor	Spiral Ceiling diffuser	125	1
Tee	Spiral Standard tee	150 : 100 : 150	1
Adaptor	Spiral Ceiling diffuser	100	1
Adaptor	Spiral Ceiling diffuser	150	1
Fitting	Spiral Attenuator	200	3
Bend 89	Spiral 1 piece long	200	2
Bend 90	Spiral 1 piece long	125	1
Bend 90	Spiral 1 piece long	100	1
Bend 53	Spiral 1 piece long	150	1
Bend 90	Spiral 1 piece long	150	1
Ductwork	Spiral	200	7.30
Ductwork	Spiral	125	1.55
Ductwork	Spiral	150	5.36
Ductwork	Spiral	100	0.85

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Supply duct sizing : Data input - Supply

Section no.	Duct type	End fitting	Upstream duct no.	Length (m)	Size limit	Additional loss	Maximum velocity	Fittings
1	Spiral	Tee : Std	-	7.3	200	PD=35	-	3xATT, 2x1LG
2	Spiral	Diffuser	1	1.55	125	PD=10	-	1LG
3	Spiral	Tee : Std	1	1.84	150	-	-	
4	Spiral	Diffuser	3	0.85	100	PD=10	-	1LG
5	Spiral	Diffuser	3	3.53	150	PD=5	-	2x1LG

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Extract duct sizing - Extract

Section	Duct type	Flow rate (m^3/s)	Size (mm)	Velocity (m/s)	Length (m)	Pressure drop (N/m^2)
1	Spiral	0.079	200	2.51	3.91	37.03
2	Spiral	0.063	200	2.01	6.25	3.51
3	Spiral	0.016	100	2.04	1.09	15.65
4	Spiral	0.048	150	2.72	6.01	7.28
5	Spiral	0.015	100	1.91	0.95	15.47
6	Spiral	0.016	100	2.04	4.26	21.53
7	Spiral	0.032	150	1.81	1.12	15.75

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Duct system HRU02 : index run

System resistance	69.35	N/m²
Total flow rate	0.079	m³/s
Index run to inlet	X1	
on floor	0	

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Extract duct damper losses - Extract

Section	Available pressure	Required pressure	Additional loss required (N/m²)	Damper specified
3	32.32	15.65	16.67	No
5	28.81	15.47	13.34	No
7	21.53	15.75	5.78	No

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Ductwork quantities, extract system : Extract

Component type	Description	Size mm	Quantity
Tee	Spiral Standard tee	200 : 200 : 100	1
Tee	Spiral Standard tee	200 : 150 : 100	1
Adaptor	Spiral Ceiling diffuser	100	3
Tee	Spiral Standard tee	150 : 100 : 150	1
Adaptor	Spiral Ceiling diffuser	150	1
Fitting	Spiral Attenuator	200	3
Bend 96	Spiral 1 piece long	200	1
Bend 89	Spiral 1 piece long	200	1
Bend 90	Spiral 1 piece long	100	3
Bend 93	Spiral 1 piece long	150	1
Bend 89	Spiral 1 piece long	150	1
Bend 77	Spiral 1 piece long	100	1
Bend 90	Spiral 1 piece long	150	1
Ductwork	Spiral	200	10.16
Ductwork	Spiral	100	6.30
Ductwork	Spiral	150	7.14

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Supply duct sizing : Data input - Extract

Section no.	Duct type	End fitting	Upstream duct no.	Length (m)	Size limit	Additional loss	Maximum velocity	Fittings
1	Spiral	Tee : Std	-	3.91	200	PD=35	-	3xATT, 1LG
2	Spiral	Tee : Std	1	6.25	200	-	-	1LG
3	Spiral	Diffuser	1	1.09	100	PD=10	-	1LG
4	Spiral	Tee : Std	2	6.01	150	-	-	2x1LG
5	Spiral	Diffuser	2	0.95	100	PD=10	-	1LG
6	Spiral	Diffuser	4	4.26	100	PD=10	-	2x1LG
7	Spiral	Diffuser	4	1.12	150	PD=10	-	1LG

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Supply duct sizing - Supply

Section	Duct type	Flow rate (m^3/s)	Size (mm)	Velocity (m/s)	Length (m)	Pressure drop (N/m^2)
1	Spiral	0.056	180	2.2	2.5	41.01
2	Spiral	0.028	125	2.28	3.55	17.01
3	Spiral	0.028	125	2.28	2.49	19.93

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Duct system HRU03 : index run

System resistance	60.94	N/m²
Total flow rate	0.056	m³/s
Index run to outlet	S3	
on floor	0	

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Supply duct damper losses - Supply

Section	Available pressure	Required pressure	Additional loss required (N/m²)	Damper specified
2	19.93	17.01	2.92	No

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Ductwork quantities, supply system : Supply

Component type	Description	Size mm	Quantity
Tee	Spiral Standard tee	180 : 125 : 125	1
Adaptor	Spiral Ceiling diffuser	125	2
Fitting	Spiral Attenuator	180	3
Bend 93	Spiral 1 piece long	125	1
Bend 90	Spiral 1 piece long	125	2
Bend 97	Spiral 1 piece long	125	1
Ductwork	Spiral	180	2.50
Ductwork	Spiral	125	6.04

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Supply duct sizing : Data input - Supply

Section no.	Duct type	End fitting	Upstream duct no.	Length (m)	Size limit	Additional loss	Maximum velocity	Fittings
1	Spiral	Tee : Std	-	2.5	-	PD=40	-	3xATT
2	Spiral	Diffuser	1	3.55	125	PD=10	-	2x1LG
3	Spiral	Diffuser	1	2.49	125	PD=10	-	2x1LG

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Extract duct sizing - Extract

Section	Duct type	Flow rate (m^3/s)	Size (mm)	Velocity (m/s)	Length (m)	Pressure drop (N/m^2)
1	Spiral	0.056	180	2.2	2.5	41.01
2	Spiral	0.028	125	2.28	3.36	18.96
3	Spiral	0.028	125	2.28	2.14	18.43

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Duct system HRU03 : index run

System resistance	59.97	N/m²
Total flow rate	0.056	m³/s
Index run to inlet	X6	
on floor	0	

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Extract duct damper losses - Extract

Section	Available pressure	Required pressure	Additional loss required (N/m²)	Damper specified
3	18.96	18.43	0.54	No

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Ductwork quantities, extract system : Extract

Component type	Description	Size mm	Quantity
Tee	Spiral Standard tee	180 : 125 : 125	1
Adaptor	Spiral Ceiling diffuser	125	2
Fitting	Spiral Attenuator	180	3
Bend 99	Spiral 1 piece long	125	1
Bend 90	Spiral 1 piece long	125	2
Bend 79	Spiral 1 piece long	125	1
Ductwork	Spiral	180	2.50
Ductwork	Spiral	125	5.49

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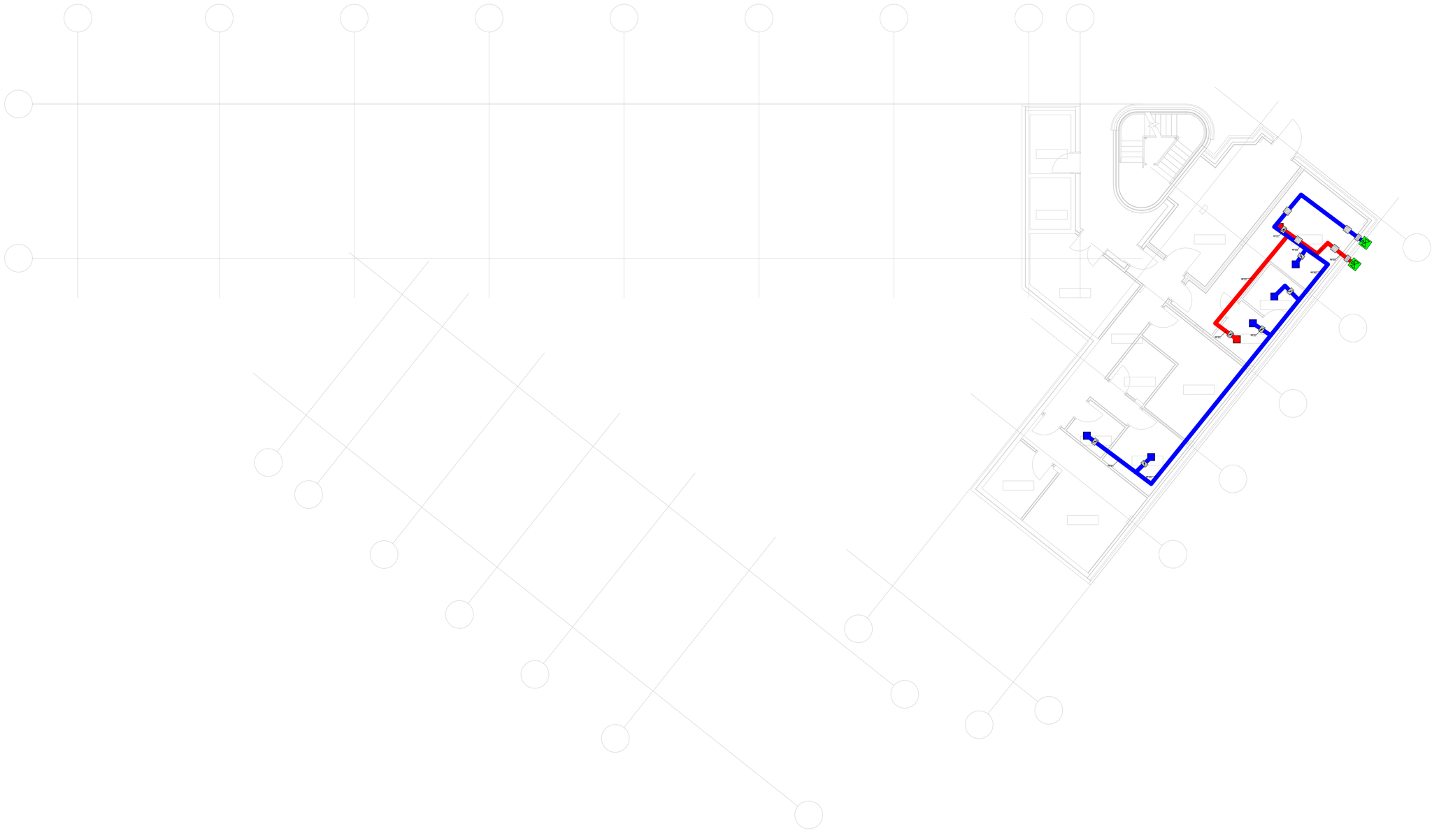
Supply duct sizing : Data input - Extract

Section no.	Duct type	End fitting	Upstream duct no.	Length (m)	Size limit	Additional loss	Maximum velocity	Fittings
1	Spiral	Tee : Std	-	2.5	-	PD=40	-	3xATT
2	Spiral	Diffuser	1	3.36	125	PD=10	-	2x1LG
3	Spiral	Diffuser	1	2.14	125	PD=10	-	2x1LG



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Extract duct sizing - Basement Exhaust

Section	Duct type	Flow rate (m^3/s)	Size (mm)	Velocity (m/s)	Length (m)	Pressure drop (N/m^2)
1	Circular	0.091	224	2.31	7.5	66.58
2	Circular	0.051	250	1.04	3.4	1.88
3	Circular	0.04	150	2.26	1.36	18.28
4	Circular	0.036	140	2.34	2.11	1.96
5	Circular	0.015	100	1.91	2.15	18.52
6	Circular	0.021	100	2.67	9.8	15.94
7	Circular	0.015	100	1.91	1.51	16.31
8	Circular	0.01	100	1.27	3.35	15.2
9	Circular	0.011	100	1.4	1.51	14.55

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Duct system Exhaust : index run

System resistance	101.56	N/m²
Total flow rate	0.091	m³/s
Index run to inlet	X5	
on floor	0	

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Extract duct damper losses - Basement Exhaust

Section	Available pressure	Required pressure	Additional loss required (N/m²)	Damper specified
3	34.98	18.28	16.7	Yes
5	33.1	18.52	14.59	Yes
7	31.14	16.31	14.82	Yes
8	15.2	15.2	0	Yes
9	15.2	14.55	0.65	Yes

Ductwork quantities, extract system : Basement Exhaust

Component type	Description	Size mm	Quantity
Tee	Circular Standard tee	224 : 250 : 150	1
Tee	Circular Standard tee	250 : 140 : 100	1
Adaptor	Circular Ceiling diffuser	150	1
Tee	Circular Standard tee	140 : 100 : 100	1
Adaptor	Circular Ceiling diffuser	100	4
Tee	Circular Standard tee	100 : 100 : 100	1
Fitting	Circular Attenuator	224	2
Bend 87	Circular 1 piece long	224	1
Bend 95	Circular 1 piece long	224	1
Bend 94	Circular 1 piece long	250	1
Fitting	Circular Damper	150	1
Bend 90	Circular 1 piece long	150	1
Fitting	Circular Damper	100	4
Bend 91	Circular 1 piece long	100	1
Bend 90	Circular 1 piece long	100	4
Bend 88	Circular 1 piece long	100	1
Ductwork	Circular	224	7.50
Ductwork	Circular	250	3.40
Ductwork	Circular	150	1.36

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Component type	Description	Size mm	Quantity
Ductwork	Circular	140	2.11
Ductwork	Circular	100	18.31

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Supply duct sizing : Data input - Basement Exhaust

Section no.	Duct type	End fitting	Upstream duct no.	Length (m)	Size limit	Additional loss	Maximum velocity	Fittings
1	Circular	Tee : Std	-	7.5	-	PD=63	-	2xATT, 2x1LG
2	Circular	Tee : Std	1	3.4	250	-	-	1LG
3	Circular	Diffuser	1	1.36	150	PD=10	-	DMN, 1LG
4	Circular	Tee : Std	2	2.11	-	-	-	
5	Circular	Diffuser	2	2.15	100	PD=10	-	DMN, 2x1LG
6	Circular	Tee : Std	4	9.8	100	-	-	1LG
7	Circular	Diffuser	4	1.51	100	PD=10	-	DMN, 1LG
8	Circular	Diffuser	6	3.35	100	PD=10	-	DMN, 1LG
9	Circular	Diffuser	6	1.51	100	PD=10	-	DMN, 1LG

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Supply duct sizing - Basement Supply

Section	Duct type	Flow rate (m^3/s)	Size (mm)	Velocity (m/s)	Length (m)	Pressure drop (N/m^2)
1	Circular	0.05	200	1.59	3.91	41.48
2	Circular	0.04	125	3.26	1.05	22.76
3	Circular	0.01	125	0.81	7.17	13.22

Duct system FAI : index run

System resistance	64.24	N/m²
Total flow rate	0.05	m³/s
Index run to outlet	S1	
on floor	0	

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Supply duct damper losses - Basement Supply

Section	Available pressure	Required pressure	Additional loss required (N/m²)	Damper specified
2	22.76	22.76	0	Yes
3	22.76	13.22	9.53	Yes

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Ductwork quantities, supply system : Basement Supply

Component type	Description	Size mm	Quantity
Tee	Circular Standard tee	200 : 125 : 125	1
Adaptor	Circular Ceiling diffuser	125	2
Fitting	Circular Attenuator	200	2
Bend 84	Circular 1 piece long	200	1
Bend 81	Circular 1 piece long	200	1
Fitting	Circular Damper	125	2
Bend 90	Circular 1 piece long	125	2
Bend 93	Circular 1 piece long	125	1
Ductwork	Circular	200	3.91
Ductwork	Circular	125	8.22

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Supply duct sizing : Data input - Basement Supply

Section no.	Duct type	End fitting	Upstream duct no.	Length (m)	Size limit	Additional loss	Maximum velocity	Fittings
1	Circular	Tee : Std	-	3.91	200	PD=40	-	2xATT, 2x1LG
2	Circular	Diffuser	1	1.05	125	PD=10	-	DMN, 1LG
3	Circular	Diffuser	1	7.17	125	PD=10	-	2x1LG, DMN