



INSYNC SERVICES
P T Y L T D

Mechanical Services

Concept Design Report

Mixed Residential Development

Site 9 - Sydney Olympic Park

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1 Executive Summary

1.1 Summary

This mechanical services Concept design report outlines the scope of works, design criteria, components and materials which shall be adopted by Insync Services Pty Ltd for completion of mechanical services design and documentation for the Site 9 mixed residential development at Sydney Olympic Park.

The report shall form the basis for communication of design principles to the client, for review, comment and sign-off by the client such that the mechanical services design and documentation can be completed for the project.

The proposed mixed development at Site 9, Sydney Olympic Park, will be constructed on a site of rectangular shape aligned North West & South East, bounded by a Sarah Durack Ave to the North West, Olympic Boulevard to the South West, Future Street 21 to the North East and Future Street 22 to the South East.

The building has an effective height of more than 50m in accordance with the definition provided under the Building Code of Australia.

1.2 Mechanical Services

The mechanical services covered by this Concept design report include;

Mechanical Services	Design Codes	Proposed Compliance
Air Handling Systems	NCC, AS 1668.2	Deemed To Satisfy
Stair Pressurisation Systems	NCC, AS 1668.1	Deemed To Satisfy
Refrigerant Systems	NCC, AS 1677	Deemed To Satisfy
Carpark Ventilation Systems	NCC, AS 1668.2	Deemed To Satisfy

*NCC – National Construction Code which includes:

- Volume 1 – Building Code of Australia – Class 2 to Class 9 Buildings
- Volume 2 – Building Code of Australia – Class 1 and 10 Buildings
- Volume 3 – Plumbing Code of Australia

2 Introduction

2.1 Background

Ecove Group Pty Ltd has engaged Insync Services Pty Ltd to provide building services consultancy for the proposed mixed residential development at Site 9, Sydney Olympic Park. Specifically, Insync Services Pty Ltd have been engaged to provide engineering consultancy with regard to mechanical services.

2.2 Scope of Services

The mechanical services engineering elements considered within this report are as follows;

- Split Air Handling Systems
- Stair Pressurisation System
- Miscellaneous ventilation systems
- Miscellaneous Exhaust systems

2.3 Aims

The aim of this Concept Design report is to provide a detailed description of the mechanical services design proposals associated with development.

Specifically the report is intended to provide a summary of the following;

- Identification of services to be provided.
- Description of the codes to which they will be installed.
- Description of the basis for design.
- Description of the required performance.
- Description of the materials to be used.

2.4 Briefing Documents

The mechanical services engineering elements considered within this report have taken into account the following preliminary documentation and investigations;

- Preliminary architectural documentation prepared by Bates Smart Pty Ltd.
- Building Code of Australia

2.5 Associated Services

The associated services engineering elements to be considered in conjunction within this report are as follows;

- Fire Detection and Alarm Services as detailed by the Electrical Engineer.
- Emergency Communication and Warning Services as detailed by the Electrical Engineer.
- Fire Rated Construction as detailed by the Architect and Structural Engineer.
- Hydraulic Services as detailed by the Hydraulic Services Engineer
- Fire Services as detailed by the Fire Services Engineer

3 Summary of Requirements

3.1 Area Schedule

Preliminary load estimates within this report have been based upon the Schedule of Area detailed below;

Building Level	Floor Level	GFA (m ²)
Ground Level	12.05	1122
Level 02	17.00	
Level 03	20.00	
Level 04	23.00	
Level 05	26.00	
Level 06	29.00	
Level 07	33.10	1866
Level 08	36.20	1723
Level 09	39.30	668
Level 10	42.40	681
Level 11	45.50	681
Level 12	48.60	681
Level 13	51.70	681
Level 14	54.80	681
Level 15	58.20	683
Level 16	61.30	683
Level 17	64.40	683
Level 18	67.50	683
Level 19	70.60	683
Level 20	74.00	683
Level 21	77.10	683
Level 22	80.20	683
Level 23	83.30	683
Level 24	86.40	683
Level 25	89.50	683
Level 26	92.60	683
Level 27	96.00	678
Level 28	99.10	678
Level 29	102.20	678
Level 30	105.30	678
Level 31	108.40	678
Level 32	111.50	678
Level 33	114.60	678
Level 34	117.70	678
Level 35	120.80	678
Level 36	124.20	719
Level 37	127.30	719
Level 38	130.40	610
Roof Level	133.50	0
Totals		25,130

3.2 Accommodation Schedule

Preliminary load estimates within this report have been based upon the Schedule of Accommodation detailed below;

Building Level	One Bed	Two Bed	Three Bed	Four Bed	Totals
Level 07	1	5	0	0	6
Level 08	1	6	0	0	7
Level 09	1	6	0	0	7
Level 10	2	6	0	0	8
Level 11	2	6	0	0	8
Level 12	2	6	0	0	8
Level 13	2	6	0	0	8
Level 14	2	6	0	0	8
Level 15	3	4	1	0	8
Level 16	3	4	1	0	8
Level 17	3	4	1	0	8
Level 18	3	4	1	0	8
Level 19	3	4	1	0	8
Level 20	3	4	1	0	8
Level 21	3	4	1	0	8
Level 22	3	4	1	0	8
Level 23	3	4	1	0	8
Level 24	3	4	1	0	8
Level 25	3	4	1	0	8
Level 26	3	4	1	0	8
Level 27	1	4	2	0	7
Level 28	1	4	2	0	7
Level 29	1	4	2	0	7
Level 30	1	4	2	0	7
Level 31	1	4	2	0	7
Level 32	1	4	2	0	7
Level 33	1	4	2	0	7
Level 34	1	4	2	0	7
Level 35	1	4	2	0	7
Level 36	0	0	0	4	4
Level 37	0	0	0	4	4
Level 38	0	0	0	3	3
Totals	58	130	30	11	229

4 Air Conditioning Systems

4.1 Air Conditioning Generally

Specifically this section of the Concept Design report shall cover the following services:

- Split Air Conditioning Systems for Apartments
- Air Conditioning of Retail/Club area
- Air Conditioning of commercial space
- Air Conditioning of Retail space

4.2 System Design

Apartments Air Conditioning

The proposed Site 9 development will provide residential facilities in accordance with the Schedule of Accommodation as detailed herein.

Residential units have been designed to include multiple zones. Living areas and bedrooms are all zoned separately and each zone will have its own concealed individual indoor split air conditioning unit. Each residential unit will have a single outdoor condenser unit associated with it which will serve all indoor air conditioning units associated with that apartment.

All Winter garden apartments level 35 and below, will have their respective condenser units situated on their level condenser plantroom. All other apartments level 35 and below, will have their condenser units located on individual balconies and each unit will be enclosed in an architectural designed partially louvered and/or perforated enclosure.

All apartments on level 36, 37 & 38 will have individual VRF condenser units located on the roof of the building, ensuring that these balconies are kept free of mechanical equipment.

Retail/Club Air Conditioning

The proposed Site 9 development Retail/Club facilities consist of two areas, Retail/Club North & Retail/Club South. Retail/Club North has the ability to be broken into four separate retail zones. The air conditioning for the Club/Retail North meets the need for four separate zones by being served by plant room area that can house four separate condenser units. The Retail/Club North will be air conditioned by ducted VRF units providing flexibility and compact installation being tailored to a future layout and mixed zoning.

Retail/Club South has the ability to be broken into two separate retail zones. The air conditioning for the Retail/Club North meets the need for two separate zones by being served by plant room area that can house two separate condenser units. The Retail/Club North will be air conditioned by ducted VRF units providing flexibility and compact installation being tailored to a future layout and mixed zoning.

Commercial space Air Conditioning

The proposed Site 9 development commercial space consist of two levels, located in the north of the through-site link above the car park levels. The two levels of the commercial space are linked by an light-well in the center of the area, causing the conditions of the center zones merge.

The commercial space will be split into 5 zones, West, North West, North East, East and center. With numerous partitioned offices, the commercial space will be air conditioned using VRF ducted units.

The center areas of level 7 and level 8 offices to be served by air handling plant located in the

level 7 & 8 plant rooms. The individual rooms and perimeter areas are to be served by dedicated fan coil units.

Outside air provision for the space will be ducted in and pre-heated through air to air heat exchangers, utilizing the spill air from the office space.

Outside air to be drawn in through louvres located in the level 7 through link plantroom ducted to the heat exchangers and discharged through the top section of the same louvres. Each heat exchanger will draw and discharge through its corresponding louver, east exchangers from east louver, and west exchangers from west louver.

The treated outside air will be distributed to the fan coil units and air handling units located in the office space and the plantroom, which is mixed with return air and delivered to the office space to AS1668.2 2012.

Retail space Air Conditioning

The proposed Site 9 development retail space consist of one area, located in the north of the ground floor facing Sarah Durack Avenue. Therefore loads will be estimated based on merchandise retail. A VRF split system will be required due to the long piping run between zone and condenser unit.

4.3 Sizing

Apartments Air Conditioning

Indoor ceiling mounted ducted units and associated condensers shall be sized with adequate capacity to maintain conditions in associated rooms/zones. In addition, ductwork where required shall be of adequate size to ensure velocities do not exceed that of the acoustic constraints for each zone as detailed by the acoustic consultant.

External condenser units will be sized to provide sufficient capacity for all internal zones taking into account day/night zoning.

Initial loads for apartments have been based on a nominal 120W/m² as per AIRAH recommendations for preliminary sizing. Using this as a guide the apartment types are indicatively sized as follows:

Apartment Type	Total Load
1 Bed	4 KW
2 Bed	5 KW
3 Bed	7 KW
4 Bed	10 KW

Retail/Club Air Conditioning

Indoor ceiling mounted ducted units and associated condensers shall be sized with adequate capacity to maintain conditions in associated rooms/zones. In addition, ductwork shall be of adequate size to ensure velocities do not exceed that of the acoustic constraints for each zone as detailed by the acoustic consultant.

External condenser units will be sized to provide sufficient capacity for all internal zones taking into account combined zoning.

Initial loads for the club/retail area has been based on a nominal 200W/m² interpreted from AIRAH recommendations for preliminary sizing. Included in the loading is a component for tempering of kitchen make up air.

Using this as a guide the Club levels are indicatively sized as follows:

Club Zone	Total Load
Club Retail North	100 KW
Club Retail South	70 KW

Commercial space Air Conditioning

Indoor ceiling mounted ducted units and associated condensers shall be sized with adequate capacity to maintain conditions in associated rooms/zones. In addition, ductwork where required shall be of adequate size to ensure velocities do not exceed that of the acoustic constraints for each zone as detailed by the acoustic consultant.

External condenser units will be sized to provide sufficient capacity for all internal zones taking into system zoning.

Initial loads for commercial areas have been based on a nominal 150W/m² averaged as per AIRAH recommendations for preliminary sizing. Using this as a guide the commercial levels are indicatively sized as follows:

Commercial Zone	Total Load
Level 5	165 KW
Level 6	155 KW

Retail space Air Conditioning

Indoor ceiling mounted ducted units and associated condenser shall be sized with adequate capacity to maintain conditions in associated zones. In addition, ductwork where required shall be of adequate size to ensure velocities do not exceed that of the acoustic constraints for each zone as detailed by the acoustic consultant.

External condenser units will be sized to provide sufficient capacity for all internal zones.

Initial loads for retail space has been based on a nominal 200 W/m² interpolated from AIRAH recommendations for preliminary sizing. Included in the loading is a component for tempering of kitchen make up air.

Using this as a guide the retail space is indicatively sized as follows:

Retail Zone	Total Load
Retail	35 KW

4.4 Installation

The air conditioning split system shall be thoroughly coordinated with all other services disciplines, structure and architecture to ensure the design not only meets the thermal load requirements but also achieves accessibility without compromising the design intent of the project.

Condensers shall be installed externally to the main building with adequate spatials to ensure accessibility and to ensure short circuiting of air does not occur.

4.5 Materials

Materials shall be constructed as follows;

Service	Location	Size	Material
Refrigerant Pipework	All	All	Phosphate deoxidized copper
Ductwork	All	All	Galvanised Sheet Steel
Flexible Ductwork	All	All	Zinc plated spring steel helix, with reinforced aluminium or foil laminate liner
Ductwork Insulation	All	All	Mineral wool, polyester or polyolefin foam

The above-nominated materials have been selected for the durability; cost effectiveness and intended purpose and are in line with current trade practice.

5 Carpark Supply and Exhaust System

5.1 Carpark Generally

Specifically this section of the Concept Design report shall cover the following services;

- Carpark Supply and Exhaust Systems

5.2 System Design

The proposed Site 9 development will provide residential and car parking facilities in accordance with the Schedule of Accommodation as detailed herein. Carpark ventilation will be provided in accordance with code requirements.

The car park will be naturally ventilated to AS 1668.2-2012

6 Outside Air Supply

6.1 Outside Air Generally

Specifically this section of the Concept Design report shall cover the following services;

- Apartment Ventilation
- Retail/Club Outside Air ventilation
- Commercial space outside air ventilation
- Retail outside air ventilation
- Lobby Ventilation

6.2 System Design

The proposed Site 9 development will provide outside air ventilation in accordance with AS 1668.2-2012.

Apartments Outside Air

Each apartment will be naturally ventilated by openable windows in accordance with the national construction code 2015 part F4.6 (a).

Retail/Club Outside Air

The Retail/Club will be ventilated through ducted outside air. A fan forced, ducted system will provide outside air to each club zone. The amount of outside air will comply with Appendix A of AS 1668.2-2012 and is estimated as follows

Club Zone	Total Load
Retail/Club North	1400 L/s
Retail/Club South	1000 L/s

Commercial Outside Air

The commercial tenancy will be ventilated through ducted outside air. A fan forced, ducted system will provide outside air to each commercial zone. The amount of outside air will comply with Appendix A of AS 1668.2-2012 and is estimated as follows

Commercial Zone	Total Load
Level 7	1350 L/s
Level 8	1250 L/s

Retail space Outside Air

The commercial tenancy will be ventilated through ducted outside air. A fan forced, ducted system will provide outside air to each commercial zone. The amount of outside air will comply with Appendix A of AS 1668.2-2012 and is estimated as follows

Commercial Zone	Total Load
Retail	350 L/s

Lobby Ventilation

Each Lobby will be ventilated with outside air to AS 1668.2-2012 Appendix A. The amount of outside air has been based on the nominal rate of 1 L/s per m².

Lift Lobby Ventilation for the residential tower will be provided by natural ventilation. Natural ventilation louvres free area to be sized at 5% lobby floor area .

Lobby ventilation air will relief through the exhaust provided by each apartments toilet and laundry exhaust systems.

The Ground Floor Residential Lobby is adjoined by an Air Lock leading to the Bin Holding Room. The Residential Lobby Air Lock shall be pressurized at 5Pa less than the Residential Lobby.

Lobby Area	Total Load
Apartment Level Lobby	50 L/s (24 levels totals 1200 L/s)
Residential Lobby	150 L/s

6.3 Sizing

Ventilation Ductwork and associated fans shall be sized to provide adequate ventilation to each level lobby. In addition, ductwork shall be of adequate size to ensure velocities do not exceed that of the acoustic constraints for each zone and as detailed by the acoustic consultant.

From this we have determined duct, riser, intake and outlet sizes as nominated on the mechanical services drawings.

6.4 Installation

The Ventilation system shall be thoroughly coordinated with all other services disciplines, structure and architecture to ensure the design not only meets the mechanical requirements but also achieves accessibility without compromising the design intent of the project.

6.5 Materials

Ductwork shall be constructed from materials as follows;

Service	Location	Size	Material
Ductwork	All	All	Galvanised Sheet Steel

The above-nominated materials have been selected for the durability; cost effectiveness and intended purpose and are in line with current trade practice.

7 General Exhaust Systems

7.1 Exhaust Systems Generally

Specifically this section of the Concept Design report shall cover the following services;

- Toilet and Laundry Exhaust Systems
- Kitchen Exhaust Systems
- Garbage Room Exhaust Systems

7.2 System Design

General exhaust requirements will be provided in accordance with code requirements.

There are four types of general exhausts required for this development which are as follows:

- Toilet and Laundry Exhaust
- Kitchen Exhaust
- Garbage Room Exhaust

Toilet and Laundry Exhaust

Toilet and laundry exhausts will use combined ductwork where possible to minimize the amount of ductwork in the building. Exhaust air for these rooms will be expelled locally to each apartment complete with a local fan. These rooms will be kept under negative pressure to ensure foul odours do not escape into adjacent areas of the associated apartment.

Kitchen Exhaust

Exhaust air from kitchens will be discharged locally to each apartment using the kitchen exhaust hood fan and appropriate filters and then expelled to the outside.

Garbage Room Exhaust

The garbage rooms on each level will be connected to a central exhaust air riser that will expel the air at roof level. These rooms will be kept under negative pressure to ensure foul odours do not escape into the lobby or adjacent apartments.

Retail Kitchen Exhaust

Kitchen Exhaust has been estimated at 2000L/s to serve a medium sized kitchen. Each kitchen exhaust system shall have installed in conjunction, a makeup air system sized at 85% of the exhaust removed from the space. The outside air shall be tempered by 10°C.

Each Retail/Club zone kitchen exhaust system will be served by an air filtering, cleaning and odor control system utilizing Electrostatic Filtering & Ozone injection. Kitchen exhaust discharge will occur through a louvre situated in the plantroom wall housing the air cleaning equipment. Enough space shall be allowed to comply with manufacturers requirements for De-odorising treatment. Air shall be discharged through the louvre at a velocity of no less than 1m/s and no more than 2.5m/s.

7.3 Sizing

Generally, all exhaust ductwork and associated fans shall be sized to provide adequate ventilation to the area they are associated with. In addition, ductwork shall be of adequate size to ensure velocities do not exceed that of the acoustic constraints for each zone and as detailed by the acoustic consultant.

Toilet and Laundry Exhaust

Allowances for Toilet and Laundry Exhaust air flow estimates are based upon minimum allowances as outlined in 1668.2. Higher flow rates may be required in order to reduce the steam where showers are located and should be designed accordingly.

Exhaust air for these rooms will be expelled locally to each apartment complete with a local fan.

Kitchen Exhaust

We have based our apartment Kitchen Exhaust air flow estimates upon the following allowances;

- 100 L/s per Kitchen

Exhaust air from kitchens will be expelled locally from each apartment to the façade using the kitchen exhaust hood fan and flow rates and associated ductwork sizes will be adjusted to suit.

Garbage Room Exhaust

We have based our Garbage Room Exhaust air flow estimates upon the following allowances;

- 5 L/s per m² of floor area

The garbage rooms on each level will be connected to a central exhaust air riser complete with a central fan that will discharge the air at roof level.

7.4 Installation

All exhaust systems shall be thoroughly coordinated with all other services disciplines, structure and architecture to ensure the design not only meets the mechanical requirements but also achieves accessibility without compromising the design intent of the project.

7.5 Materials

Ductwork shall be constructed from materials as follows;

Service	Location	Size	Material
Ductwork	All	All	Galvanised Sheet Steel (fire spray where required)

The above-nominated materials have been selected for the durability; cost effectiveness and intended purpose and are in line with current trade practice.

8 Stair Pressurisation System

8.1 Smoke Management Generally

Specifically this section of the Concept Design report shall cover the following services;

- Stair Pressurisation

8.2 System Design

The proposed Site 9 development will incorporate a stair pressurisation system that will serve the apartment tower fire stairs.

Each stair shaft will be served by two stair pressurisation fans. One fan located at the top of the stair well and one located at the bottom of each stair well. The fans will be controlled via individual variable speed drives and associated pressure sensors to ensure that pressure within the stairwell does not exceed the allowable amount.

Relief air for the stair pressurisation system will be via relief air louvres located in the lobbies of each associated level. Each louvre will be connected to a relief shaft rising to the roof level. A relief fan located at the highest point of the relief riser will create negative pressure in the relief air duct aiding in relieving the pressurised space of affected floors.

8.3 Sizing

The Stair Pressurisation and associated relief systems will be based on AS1668.1 requirements and will ensure stack effect and possible leakage will be taken into account in detailed calculations.

The Stair Pressurisation System and associated equipment shall be sized with adequate capacity to meet the requirements of AS 1668.1 and in-line with the Fire Engineer's requirements. In addition, ductwork shall be sized to ensure that safe expulsion of air is achieved as appropriate.

8.4 Installation

The Stair Pressurisation System shall be comprehensively coordinated with all other services disciplines, structure and architecture to ensure the design not only meets the safety requirements of the project and the Fire Engineer's prerequisites but also the accessibility to associated maintainable equipment such as stair pressurisation fans and the like, as required.

8.5 Materials

Ductwork shall be constructed from materials as follows;

Service	Location	Size	Material
Ductwork	All	All	Galvanised Sheet Steel (fire spray as necessary)

The above-nominated materials have been selected for the durability; cost effectiveness and intended purpose and are in line with current trade practice.

9 Spatial Requirements

9.1 Miscellaneous Systems:

Item	Description	Area	Configuration	Comments
1	Garbage Chute Exhaust Riser	0.64m ²	0.8m x 0.8m	Areas are 'clear' and all risers are fire rated.
2	Combined Garbage Room & Grease Arrestor Exhaust Riser	0.2m ²	0.45mx0.45m	Areas are 'clear' and all risers are fire rated.
3	Retail/Club North Kitchen Exhaust Duct	0.8m ²	1.45mx0.5m	Areas are 'clear' and all risers are fire rated. Requires vertical discharge.
4	Retail/Club North & Retail Kitchen Exhaust Louvre	2.53m ²	1.1mx2.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
	Retail/Club South Kitchen Exhaust	0.8m ²	1.45mx0.5m	Areas are 'clear' and all risers are fire rated. Requires vertical discharge.
5	Retail/Club South Kitchen Exhaust Louvre	1.25m ²	4.5mx0.5m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
	Retail Kitchen Exhaust Duct	0.8m ²	1.45m x 0.5m	Areas are 'clear' and all risers are fire rated. Requires vertical discharge.
6	Commercial Toilet	0.12m ²	0.4mx0.3m	Areas are 'clear' and all risers are fire rated. Requires vertical discharge.
7	Club/Retail North Toilet Exhaust	0.16m ²	0.4m x 0.4m	Areas are 'clear' and all risers are fire rated. Requires vertical discharge.
8	Retail/Club North Make Up air Louvre Size	2.5m ²	5.0m x 0.5m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
	Retail/Club South Make Up air Louvre Size	2.5m ²	5.0m x 0.5m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
9	Retail Make Up air Louvre Size	1.7m ²	3.4m x 0.5m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
10	Retail Outside Air Louvre	0.7m ²	1.4m x 0.5m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
11	Retail/Club North Outside Air Louvre	2.0m ²	4.0m x 0.5m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
12	Retail/Club South Outside Air Louvre	2.0m ²	4.0m x 0.5m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
13	Outside Air Office Level 7	0.8m ²	4.0m x 0.2m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
14	Outside Air Office Level 8	0.8m ²	4.0m x 0.2m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.

15	Gas Site Regulator Ventilation Louvre	-	Full height louvre.	Louvre full height wall Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
16	Grease Arrestor Room North Ventilation Louvre	0.3m ²	1.0m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
17	Cold Water Pump Room Ventilation Louvre	0.15m ²	0.5m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
18	Cold Water Pump Room Discharge Louvre	0.15m ²	0.5m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
19	Commercial Waste Ventilation Louvre	0.15m ²	0.5m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
20	Waste Ventilation Louvre	0.15m ²	0.5m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area. Louvre openings required top and bottom of wall.
21	Lobby Ventilation Louvre	0.15m ²	0.5m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
22	Fire Control Room Ventilation Louvre	0.15m ²	0.5m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
23	Bin Room Make Up Air Louvre	0.36m ²	1.2m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
24	Garbage Waste Room Make Up Air Louvre	0.36m ²	1.2m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
25	Pump Room Natural Ventilation Louvre	1.5m ²	5.0m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area. Louvre openings required top and bottom of wall.
26	Grease Arrestor Room South Ventilation Louvre	0.3m ²	1.0m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
27	Lift Shaft Ventilation Louvre Bottom	0.8m ²	2.6m x 0.3m	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
28	Lift Shaft Ventilation Louvre Top	0.8m ²	2.6m x 0.3m	Weatherproof louvre total size, to be a min. of 50% free area.
29	Lobby Outside Air Intake Louvre	0.15m ²	0.5m x 0.3m	Weatherproof louvre total size, to be a min. of 50% free area.
30	Lobby Supply Air Duct	0.15m ²	0.5m x 0.3m	Areas are 'clear' and all risers are fire rated.
31	Comms Room Ventilation Louvre	0.15m ²	0.5m x 0.3m	Weatherproof louvre total size, to be a min. of 50% free area.
32	Comms Room Discharge Louvre	0.15m ²	0.5m x 0.3m	Weatherproof louvre total size, to be a min. of 50% free area.
33	Commercial Condenser Units Discharge louvre	16m ²	4m x 4m	Weatherproof louvre total size, to be a min. of 80% free area. Louvre in in Level 7 plantroom roof.

9.2 Tower Stair Pressurisation System:

Item	Description	Area	Configuration	Comments
1	Riser per stair (x2)	1m ²	1000mm x 1000mm	Areas are 'clear' and all risers are fire rated.
2	Ground Fan Room per stair	24 m ²	4000mm x 6000mm	Areas are 'clear' and all risers are fire rated.
3	Roof Fan Room per stair	24 m ²	4000mm x 6000mm	Areas are 'clear' and all risers are fire rated.
4	Ground Air Intake Louvre	6m ²	6000mm x 1000mm	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
5	Roof Air Intake Louvre	6m ²	6000mm x 1000mm	Weatherproof louvre total size. Louvre to be a minimum of 50% free area.
3	Relief air riser	2 m ²	2000mm x 1000mm	Areas are 'clear' and all risers are fire rated.

9.3 Split AC System:

Item	Description	Area	Configuration	Comments
2	Apartments	4.6m x 0.7m	Triangular	Located on every level.
3	Condenser compound	0.7m		
3	Commercial & Retail	95 m ²	Rectangular	Condensers located in plantrooms require special treatment of intake and discharge air.
4	Retail/Club	10 m ²	Varies	Condensers located in plantrooms require special treatment of intake and discharge air.
5	Condenser Plant			
5	Roof Level Residential	25 m ²	Varies	Condensers located on roof level plantroom with ceiling open to atmosphere.
6	Condenser Plant			
6	Lift Lobby Air Conditioning Unit	5 m ²	2m x 2.5m	Located in Lift Lobby Ceiling
7	Lift Shaft Air Conditioning Unit	5 m ²	2m x 2.5m	Located in Level 6 North West Car Park Plant Room
8	Level 7 Office Air Handling Unit	4 m ²	2m x 2m x 3m	Located in Level 7 Plant Room 2 units 2x2x1.5 stacked 2 high.
9	Level 8 Office Air Handling Units	4 m ²	2m x 2m x 3m	Located in Level 7 Plant Room 2 units 2x2x1.5 stacked 2 high.
10	Level 7 East Office Air Heat Exchangers	5 m ²	2m x 2.5m x 2m	Located in Level 7 East Plant Room 2 units 2x2.5x1 stacked 2 high.
11	Level 7 West Office Air Heat Exchangers	5 m ²	2m x 2.5m x 2m	Located in Level 7 West Plant Room 2 units 2x2.5x1 stacked 2 high.
12	Level 8 East Office Air Heat Exchangers	5 m ²	2m x 2.5m x 2m	Located in Level 8 East Plant Room 2 units 2x2.5x1 stacked 2 high.
13	Level 8 West Office Air Heat Exchangers	5 m ²	2m x 2.5m x 2m	Located in Level 7 East Plant Room 2 units 2x2.5x1 stacked 2 high.

Note: All sizing is based on preliminary information and plans and subject to revision and alteration upon precise details being received.