Mechanical Services

Concept Design Report

Social and Affordable Housing Fund - Stage 2

9-15 Northumberland Street, Liverpool

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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 will be adopted by Insync Services for completion of the mechanical services design and documentation for the proposed Social and Affordable Housing Fund – Stage 2 development site at 9-15 Northumberland Street, Liverpool.

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

1.2 Code Compliance

The mechanical services covered by this concept design report will be designed to comply with the following requirements;

Mechanical Services	Design Codes	Proposed Compliance
Ventilation Systems	NCC 2016 AS 1668.2	Deemed to Satisfy
Smoke Control Systems	NCC 2016 AS/NZS 1668.1	Deemed to Satisfy
Air Conditioning Systems	NCC 2016 AS/NZS 5149.1	Deemed to Satisfy
Ductwork Installations	AS 4254.1 AS 4254.2	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

1.3 General Ventilation Requirements

All habitable spaces require ventilation in accordance natural ventilation requirements of BCA section F4.5 and AS 1668.2-2012.

1.4 Smoke Management System Requirements

Due to the configuration of the development, and as the buildings exceeds 25m in effective height, an automatic air pressurization system for fire isolated stairs in accordance with AS/NZS 1668.1 is required.

1.5 Air Conditioning System Requirements

Air conditioning is to be provided to non-residential (building management, lounge, office space, communal, dining, function room, kiosk, sleep pods and kitchen area) and all strata apartments (No air conditioning to SAH apartments).

2 Introduction

2.1 Background

Anglicare has engaged Insync Services to provide building services consultancy for the proposed Social and Affordable Housing Fund – Stage 2 development site at 9-15 Northumberland Street, Liverpool. Specifically, Insync Services have been engaged to provide engineering consultancy concept design reports to cover the following building services disciplines;

- Fire Services
- Hydraulic Services
- Electrical Services
- Mechanical Services

2.2 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 intended performance.
- Opinion of cost.
- Summary of spatial requirements.

This document shall form the basis for communication of design principles and specific building services design requirements to the Client and wider design team, such that the building services design principles can be fundamentally incorporated into the architectural planning proposal to be submitted for the development.

2.3 Briefing Documents

The mechanical services engineering elements considered within this report have considered the following preliminary documentation and investigations:

- National Construction Code.
- Relevant Australian Standards.
- Authority design and guidelines.
- Preliminary architectural drawings prepared by Group GSA Pty Ltd.

2.4 Development Description

Based on the architectural the proposed development consists of the following;

1. Two levels of basement which comprise carpark, fire sprinkler pump room, store room and services room
2. Building management, lounges areas, office, Kiosk, dining, sleep, function room and services room on ground floor
3. SAH and STRATA rental apartments distributed between levels 1 to 11.
4. The development is more than 25m in effective height as Classified by the National Construction Code.

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.
- Acoustic Performance as detailed by the Acoustic Engineer.
- BASIX and Section J report as detailed by the ESD Engineer.
- Hydraulic water, gas & drainage as detailed by the Hydraulic Engineer
- Fire Services as detailed by the Fire Engineer.

3 Design Principles

3.1 Background

Anglicare have specific requirements in terms of building services outcomes with regard to this development including the following areas;

- Cost & Efficiency
- Quality & Longevity
- Uniformity
- Serviceability

All design shall be prepared with due regard to building services design such that the clients overall objectives for the development can be realised. In particular, the spatial requirements for building services shall be determined and incorporated into the architectural proposals from first principles so that further development of the architectural proposals can be undertaken as the design progresses without the need to backtrack and compromise architectural integrity of the submission as a result of building services requirements that have not previously been adequately considered.

3.2 Cost & Efficiency

The client has aggressive cost benchmarks which will be required to be achieved for the procurement of this development. These benchmarks are not able to be achieved without the fundamental integration and coordination of building services concurrent with development of the architectural design. Specific areas for consideration include the following;

- Equipment location for maximum efficiency.
- Adequate floor to floor heights.
- Vertical alignment of services risers.
- Standardised design forms that bring cost savings through repetition.
- Development of typical components that can be pre-fabricated off site.
- Continuity of wet area locations at typical floor changes to reduce bulkheads below.
- Modular design of plant where applicable to match proposed construction staging.
- Selection of standard manufacture equipment that is readily available.
- Selection of low maintenance plant & equipment.
- Duplication of equipment where required to provide operational redundancy in critical aspects of the buildings operation.
- Exhaust discharge grouped in the centre of the building to satisfy requirements of the NCC & AS1668 separation between ventilation openings and exhaust discharge.

3.3 Quality & Longevity

The client requires a building that is fit for purpose in terms of the requirements for its ongoing operation. **Selection of plant and equipment shall provide trouble free operation over the duration of its life cycle, aside from the regular maintenance program**. Equipment shall be selected with due consideration to having demonstrated proven reliability on similar installations, in similar operating conditions. Equipment supply shall be via companies that can demonstrate a long-term trading history in the Australian market, and have local agents capable of providing the necessary technical support and parts availability as will be required throughout the equipment's life cycle.

3.4 Uniformity

Uniformity of type and manufacture of each specific type of equipment and accessory would be preserved throughout the whole installation. Where possible the number of types of equipment provided by an individual supplier would be maximised.

3.5 Serviceability

The client requires a building that is fit for purpose in terms of the requirements for its ongoing operation. Spatial allocation for plant and equipment shall provide due consideration for all ongoing maintenance requirements of the equipment, including total replacement of the equipment at completion of its life cycle. Adequate clearance shall be provided around all equipment for maintenance access, with due consideration given to aspects of Safety In Design principles as may be applicable. Access shall be arranged so as to provide minimal disruption to the normal operation of the building and minimise any inconvenience to the building occupants. **Any need to alter or damage building fabric to effect equipment maintenance shall be avoided under all circumstances**.

4 Scope of Work

4.1 Extent of Services

The extent of mechanical services required throughout the development shall include the following:

- Carpark ventilation system
- Fire hydrant pump room ventilation system
- Electrical main switch room ventilation system
- Services room ventilation system
- Commercial kitchen base building ventilation system provisions (kitchen hood and fans and all associated controls to be by tenant)
- Outside air ventilation system arrangement to all habitable office spaces on ground floor (Building management, lounges areas, office, Kiosk, dining, sleep and function room)
- Exhaust ventilation system arrangement to all toilets/WC/cleaner spaces on ground floor
- Garbage ventilation systems
- Miscellaneous ventilation systems (Stores, plantrooms, outdoor air as required by code)
- Relief Air Provisions
- Air Conditioning to ground floor spaces (Building management, lounges areas, office, Kiosk, dining, sleep and function room)
- STRATA residential apartment air conditioning systems only (No air conditioning to SAH apartments)
- SAH and STRATA residential apartment toilet and laundry exhaust ventilation system (no kitchen hood ventilation system to all apartments)
- Air conditioning to communal spaces on levels – 1, 6, 7, 8, 9, 10 and 11.
- Fire Stair Pressurisation Systems
- Lobby Relief Systems

4.2 Code Compliance

The proposed code compliance for mechanical services required throughout the development shall include the following:

Mechanical Services	Design Codes	Proposed Compliance
Carpark Ventilation Systems	National Construction Code AS/NZS 1668.1, AS 1668.2 and AS4254.2	Deemed To Satisfy
Fire Hydrant Pump Room Ventilations	National Construction Code AS/NZS 1668.1, AS 1668.2 and AS4254.2	Deemed To Satisfy
Miscellaneous and Service Rooms Ventilation Systems	National Construction Code AS/NZS 1668.1, AS 1668.2 and AS4254.2	Deemed To Satisfy
Commercial Kitchen Ventilation Systems	National Construction Code AS/NZS 1668.1, AS 1668.2 and AS4254.2	Deemed To Satisfy
Toilet Exhaust Ventilation Systems	National Construction Code AS/NZS 1668.1, AS 1668.2 and AS4254.2	Deemed To Satisfy
Ground Floor Air Conditioning	National Construction Code AS 1677, AS 1668.2	Deemed To Satisfy
Apartment and Communal Space Air Conditioning	National Construction Code AS 1677, AS 1668.2	Deemed To Satisfy
Stair Pressurisation Systems	National Construction Code AS/NZS 1668.1, AS 1668.2	Deemed To Satisfy
Stair Pressurisation Relief Systems	National Construction Code AS/NZS 1668.1, AS 1668.2	Deemed To Satisfy

Residential Apartment Air Conditioning Systems	National Construction Code AS 1668.2, AS 1677	Deemed To Satisfy
Residential Apartment Toilet and laundry Exhaust Systems	National Construction Code AS 1668.2	Deemed To Satisfy

4.3 Scope of Work – Carpark Ventilation System

The scope of work required shall include, but not be limited to, the following:

- Procurement, installation and connection of all ductwork and risers.
- Procurement, installation and connection of all fans.
- Procurement, installation and connection of drainage pipework to tundish. All risers and horizontal ductwork to outside must be angled to drain complete with drainage pipework to be connected to tundish.
- Procurement and installation of all acoustic insulation and associated attenuators and any other required acoustic treatment.
- Fire rating of ductwork, supports and systems as required.
- Procurement, installation and connection of all grilles, diffusers, dampers, plenum boxes and filters. Grilles used shall be powder coated to meet architectural requirements and shall be reviewed and approved by the principal prior to installation.
- Identification of all grille/diffuser locations on typical plans for review and approval by the principal.
- Procurement, installation and connection of all associated controls, CO sensors, associated wiring, boards and alarms in accordance with AS/NZS 1668.1
- Underflashing of all mechanical services external penetrations.
- Procurement and installation of VSDs.
- Painting and identification.
- Commissioning of all equipment.

4.4 Scope of Work – All Exhaust Systems

The scope of work required shall include, but not be limited to, the following:

- Procurement, installation and connection of all ductwork including low profile ductwork where required.
- Procurement, installation and connection of all fans.
- Procurement, installation and connection of drainage pipework to tundish. All risers and horizontal ductwork to outside must be angled to drain complete with drainage pipework to be connected to tundish.
- Procurement and installation of all acoustic insulation, associated attenuators and acoustic treatment.
- Fire rating of ductwork, supports and systems as required.
- Procurement, installation and connection of fire dampers and smoke dampers as required.
- Procurement, installation and connection of all grilles, diffusers, plenum boxes and filters. Grilles used shall be powder coated to meet architectural requirements and shall be reviewed and approved by the principal prior to installation.
- Identification of all grille/diffuser locations on typical plans for review and approval by the principal.
- Procurement, installation and connection of all associated controls, associated wiring, boards and alarms in accordance with AS/NZS 1668.1.
- Underflashing of all mechanical services external penetrations.
- Procurement and installation of VSDs.
- Procurement, installation and fire rating of ductwork, supports and systems as required.
- Painting and identification including painting of all exposed ductwork including ductwork that is visible through grilles and diffusers.
- Commissioning of all equipment.

4.5 Scope of Works – All Outside Air Systems

The scope of work required shall include, but not be limited to, the following:

• Procurement, installation and connection of all ductwork including low profile ductwork where required.
• Procurement, installation and connection of all fans.
• Procurement, installation and connection to outside air louvers air louvers mounted on the building façade. All weather proof louvers to be completed with wire mesh, filters, filters plenums, access panels and balancing dampers.
• Procurement, installation and connection of drainage pipework to tundish.
• Procurement and installation of all acoustic insulation, associated attenuators and acoustic treatment.
• Fire rating of ductwork, supports and systems as required.
• Procurement, installation and connection of fire dampers and smoke dampers as required.
• Procurement, installation and connection of all grilles, diffusers, plenum boxes and filters. Grilles used shall meet the specification in the table below, shall be powder coated to meet architectural requirements and shall be reviewed and approved by the principal prior to installation.
• Identification of all grille/diffuser locations on typical plans for review and approval by the principal.
• Procurement, installation and connection of all associated controls, associated wiring, boards and alarms in accordance with AS/NZS 1668.1
• Underflashing of all mechanical service's external penetrations.
• Procurement and installation of VSDs.
• Procurement, installation and fire rating of ductwork, supports and systems as required.
• Painting and identification including painting of all exposed ductwork including ductwork that is visible through grilles and diffusers.
• Commissioning of all equipment.

4.6 Scope of Work – Base Building Commercial Kitchen Ventilation System Provision

The scope of work required shall include, but not be limited to, the following:

• Procurement, installation of all base building ductwork, riser and provisions for future connections to be in accordance with AS4254.2; entire installation to be in accordance with AS/NZS 1668.1:2015 and AS1668.2:2012
• Procurement, installation of outside air louvers mounted on the building façade and provisions for future connections. All weather proof louvers to be completed with wire mesh, filters, filters plenums, access panels, balancing dampers and provision for future ductwork connections.
• Procurement, installation of sealed removable duct access panels for cleaning.
• Procurement, installation and provision to connect future commercial kitchen hood and fans. Connections to be blanked off and completed with volume control dampers.
• Procurement, installation of grease tight tap or plug at the bottom of the kitchen exhaust riser.
• Procurement, installation and connection of drainage pipework to tundish. All risers and horizontal ductwork to outside must be angled to drain complete with drainage pipework to be connected to tundish.
• Procurement and installation of all acoustic insulation and associated attenuators and any other required acoustic treatment.
• Fire rating of ductwork, supports and systems as required.
• Procurement and installation of all fire rating insulation on the kitchen exhaust duct when any combustible materials are within 300mm of the kitchen exhaust.
• Procurement, installation and connection of all dampers, plenum boxes and filters.
• Identification of all grille/diffuser locations on typical plans for review and approval by the principal.
• Procurement, installation and connection of all associated controls, sensors, associated wiring, boards and alarms.
• Underflashing of all mechanical services external penetrations.

• Procurement and installation of VSDs.

4.7 Scope of Work – Air Conditioning

The scope of work required shall include, but not be limited to, the following:

- Carry out detailed calculations on heating and cooling loads to determine appropriate capacities of air conditioning system to meet the design conditions outlined in the table below and meeting all relevant codes, standards and BASIX.
- Natural ventilation to all habitable spaces shall be in accordance with the Development Consent, the National Construction code and BASIX requirements.
- Procurement and installation Single Split/VRV/VRF air conditioning units which shall be of Daikin, Mitsubishi or approved equivalent manufacture.
- Procurement and installation outdoor condenser units which shall be of Daikin, Mitsubishi or approved equivalent manufacture, Single Split/VRV/VRF type installation shall meet manufacturer's requirements.
- Procurement, installation and connection of all refrigerant pipework
- Procurement, installation and connection of all drainage pipework. All condensate pipework shall be diverted to nearest tundish complete with clearance and access to the tundish. All risers and horizontal pipes ductwork to outside must be angled to drain complete with drainage pipework to be connected to tundish.
- Procurement and installation of all insulation
- Procurement, installation and connection of all grilles, diffusers, dampers, plenum boxes and filters. Grilles used shall be powder coated to meet architectural requirements and shall be reviewed and approved by the principal prior to installation.
- Identification of all grille/diffuser locations on typical plans for review and approval by the principal.
- Underflashing of all mechanical services external penetrations
- Procurement, installation and connection of all ductwork, attenuators, volume control and the like
- Procurement, installation and connection of all temperature sensors, associated wiring and alarms
- Procurement, installation and connection of all associated controls, control panels, associated wiring and alarms
- Air-conditioning metered from the apartment's/tenancy electrical sub board.
- Final connection of power and fire alarms to apartment's/tenancy sub board.
- All condensers located in the plant space shall have associated piping, electrical wiring installed and constructed in a neat and professional manner with all electrical wiring on cable trays.
- Procurement and installation of VSDs.
- Procurement, installation and fire rating of ductwork, supports and systems as required
- Make-good of all areas.
- Acoustic treatment.
- Painting and identification including painting of all exposed ductwork including ductwork visible through grilles and diffusers. All condensers shall be labelled with the associated apartment number clearly visible from a standing position. Positioning, label format and type to be approved by the Principal.
- Commissioning of all equipment.

4.8 Scope of Work – Fire Stair Pressurisation

The scope of work required shall include, but not be limited to, the following:

- Procurement, installation and connection of all ductwork.
- Procurement, installation and connection of all fans.
- Procurement, installation and connection of drainage pipework to tundish. All Risers and horizontal ductwork to outside must be angled to drain complete with drainage pipework to be connected to tundish.
- Fire rating of ductwork, supports and systems as required.
- Procurement, installation and connection of all grilles, diffusers, dampers, plenum boxes and

filters. Grilles used shall be powder coated to meet architectural requirements and shall be reviewed and approved by the principal prior to installation.
- Identification of all grille/diffuser locations on typical plans for review and approval by the principal.
- Procurement, installation and connection of all associated controls, sensors, associated wiring, boards and alarms.
- Underflashing of all mechanical services external penetrations.
- Procurement and installation of VSDs.
- Fire rated control wiring from FFCP to mechanical equipment as required.
- Acoustic treatment.
- Painting and identification.
- Commissioning of all equipment.

5 Design Criteria

5.1 Authorities Requirements

We understand there is no DA requirement that the Mechanical systems shall be designed to be compliant to bush fire requirements.

We understand that no formal NABERS Commitment or Green Star rating is a requirement.

5.2 Ventilation

Mechanical ventilation system capacities have been designed to be compliant with the requirements of the ventilation code AS 1668.2-2012.

5.3 Smoke Control

As per BCA 2016 and AS/NZS 1668.1-2015 no specific mechanical smoke control is required in the development except for stair pressurization and lobby relief.

5.4 STRATA Apartment Air Conditioning:

STRATA apartment air conditioning is to be sized to serve the whole dwelling with wall mounted air conditioning in the living room only for each apartment

The air conditioning system would be 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 to be installed in the balcony. Installation to be in accordance with NCC Table D2.16a Barrier climb-ability. Refer to Mechanical Services Spatial Layouts in the Appendix.

5.5 Non-residential Spaces

Air conditioning serving non-residential spaces would be designed as a commercial grade system and design to provide 100% air conditioning to most enclosures.

Initial loads have been based on a nominal heat load check figures as per AIRAH Technical Handbook which are recommended for preliminary sizing only. Detailed heat loads are required to determine design heat loads which would be conducted in the next phase of design.

Outdoor air loads have been based on the nominal population densities as provided in Table A1 of AS 1668.2-2012, or otherwise finalized as part of the next stage of design.

5.6 Lobbies/Corridors

Lobby/corridor shall be natural ventilated in accordance with BCA F4.6 Natural Ventilation requirements (ventilating area not less than 5% of the floor area of the room required to be ventilated).

6 Ventilation Systems

6.1 Ventilation Systems Generally

Specifically, this section of the report shall cover the following services;

- Carpark ventilation systems
- Fire hydrant pump room ventilation system
- Electrical main switch room ventilation system
- Services room ventilation system
- Garbage ventilation system
- Commercial kitchen tenancy base building provisions ventilation arrangement system only (kitchen hood and fans and all associated controls to be by tenant)
- Outside air ventilation system arrangement to all office habitable spaces on ground floor
- Exhaust ventilation system arrangement to all toilets/WC/cleaner spaces on ground floor
- Miscellaneous ventilation systems (Stores, plantrooms, outdoor air as required by code)
- Relief Air Provisions
- SAH and STRATA residential apartment toilet and laundry exhaust ventilation system
- Fire Stair Pressurisation Systems
- Lobby Relief Systems

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.

All exhaust systems shall be 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.

6.2 Carpark Ventilation

Ventilation of the car park consist of the following:

- Supply air provision is introduced into the carpark through the entry via perforated entry roller gate for part of basement 1 level. The remaining part of basement 1 and whole of basement 2 level will require ducted make up air from the ground floor to the car park.

- Exhaust air would be drawn from ducts running the perimeter of the car park walls, meeting at the main riser near the core. Exhaust to discharge at roof level. Car park discharge shall be 6m away from a property boundary and any outdoor air intake openings or any natural ventilation devices or openings.

General

- CO monitoring would be used to control the operation of the ventilation systems in accordance with AS 1668.2-2012.

- Car Park Supply and Exhaust risers/ductwork and associated fans would be sized to provide adequate ventilation in the Car Park. Ductwork would 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.

- Car Park ventilation sized in accordance with NCC and AS 1668.2-2012 requirements. Calculations consider the area of the carpark and number of car spaces taken from the architectural drawings. Using this information, we have calculated the maximum requirement for supply and exhaust air for the two levels of carpark. From this we have determined duct, riser, intake and outlet sizes as nominated on the mechanical services drawings.

- Car park ventilation systems shall be provided with an electrical supply from a clearly labelled dedicated main switch, separate from those used to control the remainder of the electrical installation and provide control switches at the FFCP as required for operation of fan by the Fire Brigade.

6.3 Fire Hydrant/Sprinkler Pump Room Ventilation

Mechanical supply and exhaust air system are required for the Fire Hydrant/Sprinkler Pump Room. Outdoor air would be drawn in from the carpark entry ramp and discharge from the space via a ductwork connecting to exhaust riser and discharge a roof level. The system will be sized based on the diesel pump air and cooling requirements.

Both supply and exhaust fans are mounted at high level in the Basement 1 pump room.

6.4 Electrical Main Switch Room Ventilation

Mechanical supply air system is required for the Electrical Main Switch Room. Outdoor air would be drawn in from the carpark entry ramp via rigid sheet metal duct and relieved out in to the car park.

6.5 Garbage Exhaust System

Garbage room to be mechanically ventilated incorporating exhaust fan located in the carpark and transfer the exhaust air into a riser which will discharge at roof level. The exhaust air quantity to be in accordance with AS 1668.2.

The makeup air of the garbage room exhaust system though garbage room security perforated door/door grille

6.6 Outside Air Ventilation System

Specifically, this section of the Concept Design report shall cover the outside air required for the following;

- All office habitable spaces on ground floor and
- Lounge, Dining Sleep PODS, KOSK and Function areas

Outside air to serve the all the fan coil units serving the above spaces will be through weather proof façade louvres located in ceiling void. The system to be incorporated with ductwork, filters, associated fans and all associated ductwork connections and control wiring to form a complete system. All installation to be done in accordance with all relevant standards and all specific requirements to meet the DA and Building Code of Australia.

6.7 Commercial Kitchen Ventilation system

Considering the kitchen space will incorporate a commercial kitchen hood, the development shall allow base building kitchen ventilation arrangement to connect the future commercial kitchen hood system.

The base building kitchen ventilation arrangement shall include a kitchen exhaust riser, ductwork, take-off's, grease tight tap or plug at the bottom of the kitchen exhaust riser, sealed access panels and supports. Connection to be blanked off and completed with volume control dampers. All ductwork and installation to be in accordance with all relevant standards and Building Code of Australia.

Makeup air to the future commercial kitchen hood though weatherproof faced louvres in ceiling.

It is responsibility of the tenant for future kitchen hood, exhaust fan, make-up air fan connections. All installations are done in accordance with Building code of Australia and all relevant Australian Standard to form a complete compliant system.

Note: Kitchen exhaust air riser is sized to meet an estimated air quantity of 1500l/s. Any deviation to these number requires upgrade to the base building kitchen exhaust riser and ductwork system.

6.8 Apartment Toilet and Laundry Exhaust

Toilet and laundry exhausts would use combined ductwork where possible to minimize the amount of ductwork in the building. Exhaust air from these rooms would be discharged horizontally from each apartment complete with a local fan. Allocate 250mm height clear ceiling void space or bulkhead for duct run and duct connections to weatherproof façade louvre. These rooms would be kept under negative pressure to ensure foul odours do not escape into adjacent areas of the associated apartment.

Allowances for Toilet and Laundry Exhaust air flow estimates are based upon minimum allowances as outlined in AS 1668.2-2012 and increased where higher flow rates are required to reduce the steam where showers are located.

7 Smoke Control Systems

7.1 Smoke Control Systems Generally

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

- Stair Pressurisation.

System Design

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

Each stair shaft will be served by a stair pressurisation fans located at the top of each stair. 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 operable louvres located at the ends of each corridor. These are also utilized for corridor natural ventilation.

Sizing

The Stair Pressurisation and associated relief systems will be based on AS/NZS 1668.1 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/NZS 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.

Installation

The Stair Pressurisation System shall be 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.

7.2 FIRE MODE OPERATION

The fire mode strategies will be determined in accordance with the requirements of AS/NZS 1668.1-2015.

Ground Floor Tenancies:

Mechanical services plant and equipment serving the ground floor management, lounge and other habitable spaces shall shut down.

Commercial Kitchen:

On the initiation of fire mode, if the kitchen exhaust system is already operating, it shall not shutdown.

Fire Hydrant/Sprinkler Pump Room:

Fire sprinkler pump room exhaust system operate on full speed.

Stair Pressurisation System

Stair Pressurisation fan shall get activated in the fire mode.

Main electrical Switch room

Supply fan shall operate in fire mode.

Apartments

All exhaust systems serving the apartments can continue to run.

8 Air Conditioning Systems

8.1 Air Conditioning Systems Generally

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

8.1.1 Air-cooled Single Split Systems (STRATA Apartments)

- Residential air-cooled single split system with wall mounted fan coil units serving living room apartment with 100% air conditioning configuration.
- The condensers would to be in apartment balconies.
- Refrigerant pipework would reticulate from the condenser to fan coil units through ceiling void.
- Power for the air-cooled condenser would be run in with pipework and be served from respective Tenant DB.

8.1.2 Air-cooled VRV/VRF Systems (Non-residential Spaces)

- Non-residential spaces such as building managements, office, lounge, function rooms, sleep PODS, dining and KIOSK areas will be served by air-cooled VRV/VRF system ducted fan coil units mounted in the ceiling void space.
- The VRV/VRF condensers would be located on the dedicated ground floor mechanical plant space;
- Refrigerant pipework would reticulate from the condenser platform to each corresponding fan coil unit through ceiling void space. Space is required with corridor/lobby ceiling spaces for reticulation of insulated pipework.
- Power for the air-cooled condenser would be run in with pipework and be served from respective House DB.

9 Electrical and Controls

9.1 Mechanical Electrical

The mechanical electrical infrastructure would be designed in the following configuration:

- Electrical contractor to provide sub-main supplies to mechanical essential and non-essential mechanical services switchboards (MSSBs).

- We envisage MSSBs to be installed in:
  - Basement for Car Park
  - Ground floor and
  - Roof for essential and general ventilation systems if required.

9.2 Mechanical Controls

The following is a highly level summary of mechanical control solutions/options for the various mechanical options presented in this report:

- Car Park ventilation: Car park ventilation will operate via CO monitoring systems and controlled in accordance with AS 1668.2-2012. In fire mode, systems would initially run at full speed and control as per requirements of AS 1668.1:2015;

- Stair Pressurisation: Stair Pressurisation will operate via signal received from the FIP and activated at the FFCP as per requirements of AS 1668.1:2015 and AS 1670.1.

- Kitchen Exhaust: Ventilation systems would be activated on as used basis, with the capability of being switched off when not in use to the requirements of section J of the NCC 2016.

- Miscellaneous ventilation: Ventilations systems such as garbage exhaust, toilet exhaust and the like would be controlled via time clock or 24/7 as required.

- Ground Floor condensers: Would operate as required to by fan coil unit operation. In fire mode, system would continue running.

- Apartment fan coil units: Would operate as controlled by individual occupants. In fire mode fan coil units would continue running.

10 Spatial Requirements

10.1 Main Risers:

Item	Description	Area	Configuration	Comments
	Carpark			
1	Basement 2 carpark exhaust riser	0.56m^2	0.8mx0.7m	Areas are 'clear' and all risers are fire rated.
2	Basement 1 carpark exhaust riser	0.98m^2	1.4mx0.7m	Areas are 'clear' and all risers are fire rated.
2	Basement 2 carpark make-up air riser	0.49m^2	0.7mx0.7m	Areas are 'clear' and all risers are fire rated.
3	Basement 1 carpark make-up air riser	0.85m^2	1.2mx0.7m	Areas are 'clear' and all risers are fire rated.
4	Stair Pressurisation Riser – Stair 1.	1.2m^2	2.4m x 0.6m	Connected to each fire stair, fan located on roof.
5	Stair Pressurisation Riser – Stair 2.	1.2m^2	2.4m x 0.5m	Connected to each fire stair, fan located on roof.
6	Fire sprinkler hydrant pump room	0.32m^2	0.8mx0.4m	Areas are 'clear' and all risers are fire rated.
7	Base Building Kitchen Exhaust Riser	0.36m^2	0.6mx0.6m	Areas are 'clear' and all risers are fire rated.

11 Appendix

11.1 Mechanical Services Spatial layouts

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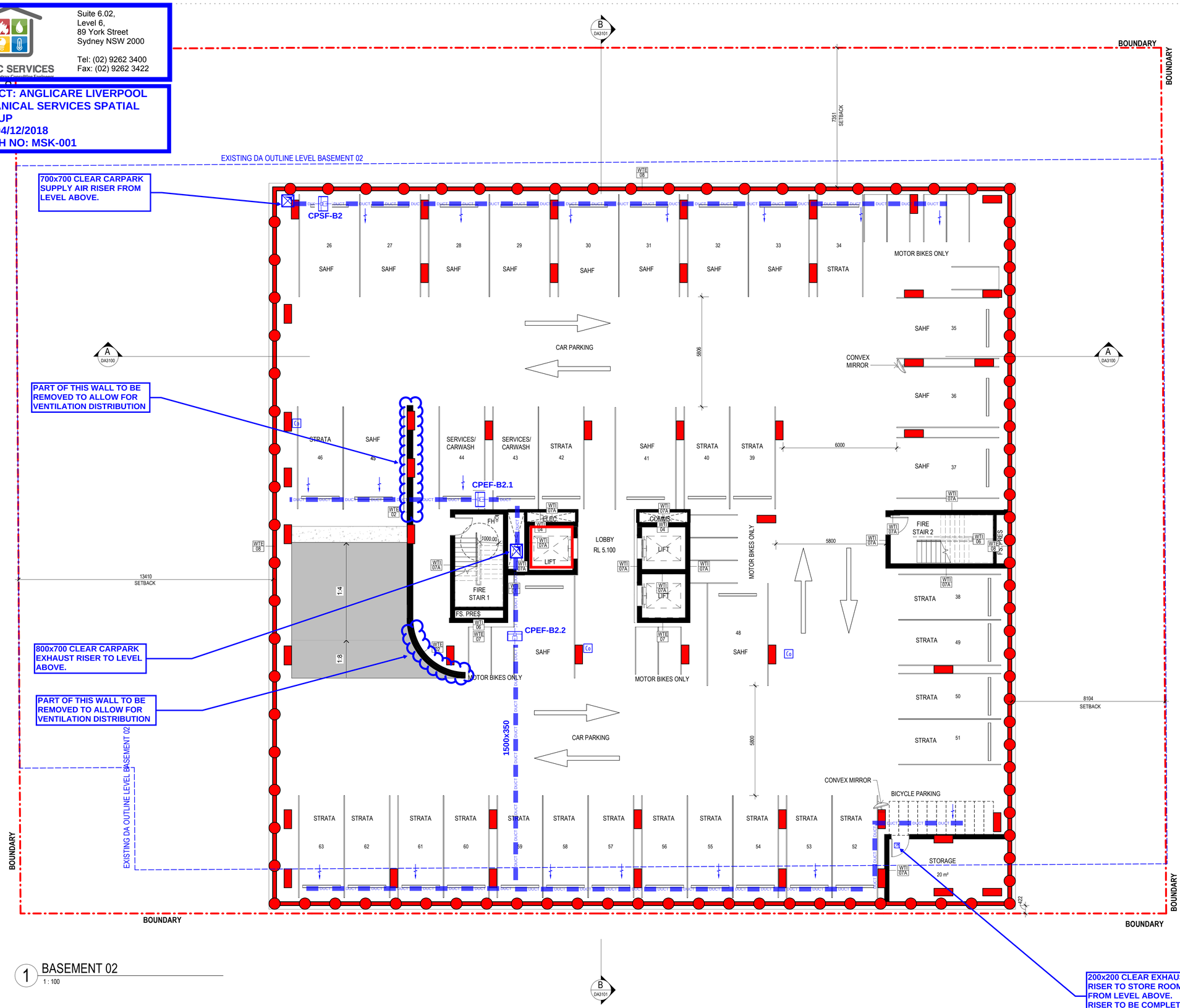
PROJECT: ANGLICARE LIVERPOOL
MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
SKETCH NO: MSK-001



1 BASEMENT 02
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Amendments

Issue	Description	Date
A	ISSUE FOR COORDINATION	14/08/2018
B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
D	ISSUE FOR INFORMATION	06/11/2018
E	ISSUE FOR INFORMATION	28/11/2018

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Project Title
ANGLICARE - LIVERPOOL

Drawing Title
BASEMENT 2 GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	LMC
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2000	E

28/11/2018 10:46:07 AM

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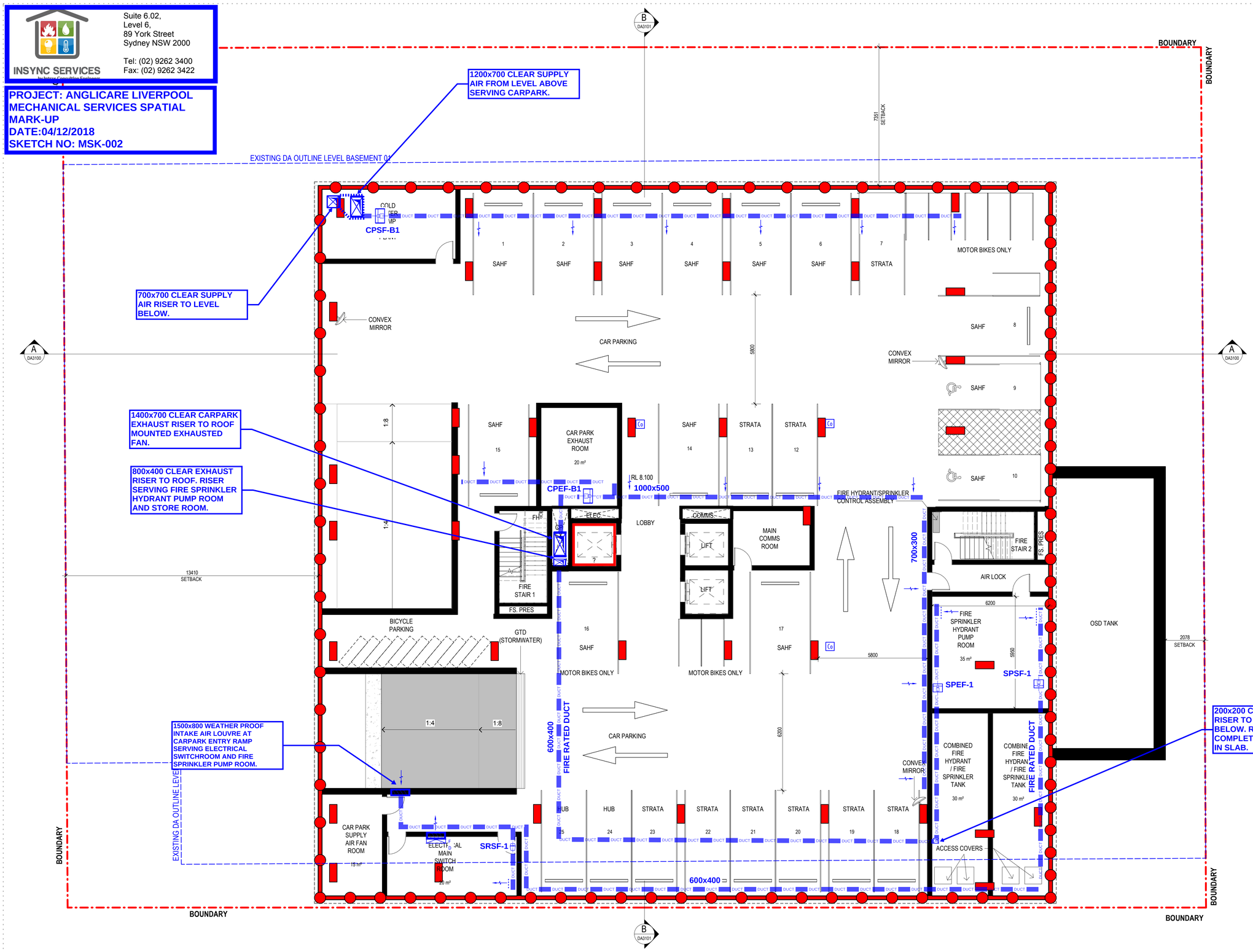
PROJECT: ANGLICARE LIVERPOOL
MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
SKETCH NO: MSK-002



1 BASEMENT 01
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Amendments

Issue	Description	Date
A	ISSUE FOR COORDINATION	14/08/2018
B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
D	ISSUE FOR INFORMATION	06/11/2018
E	ISSUE FOR INFORMATION	28/11/2018

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Project Title
ANGLICARE - LIVERPOOL

Drawing Title
BASEMENT 1 GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	LMC
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2001	E

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PROJECT: ANGLICARE LIVERPOOL MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
SKETCH NO: MSK-003

Amendments

Issue	Description	Date
A	ISSUE FOR COORDINATION	14/08/2018
B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
D	ISSUE FOR INFORMATION	06/11/2018
E	ISSUE FOR INFORMATION	28/11/2018

3200X1600 MECHANICAL PLANT SERVING BUILDING MANAGEMENT SPACE. PLANT TO BE ENCLOSED IN LOUVRES. ACOUSTIC TREATMENT SUBJECT TO ACOUSTIC REQUIRMENTS.

3500X1600 MECHANICAL PLANT SERVING STAFF LOUNGE AND LOUNGE. PLANT TO BE ENCLOSED IN LOUVRES. ACOUSTIC TREATMENT SUBJECT TO ACOUSTIC REQUIRMENTS.

SUPPLY AIR INTAKE PLENUM SERVING CARPARK. WEATHERPROOF INTAKE AIR LOUVRES ON ALL FOUR SIDES

3500X1600 MECHANICAL PLANT SERVING DINING, OPEN OFFICE, KITCHEN AND SLEEP AREA. PLANT TO BE ENCLOSED IN LOUVRES. ACOUSTIC TREATMENT SUBJECT TO ACOUSTIC REQUIRMENTS.

REQUIRED WEATHER PROOF LOUVRE OPENEING 0.12m² FOR OUTSIDE AIR.

REQUIRED WEATHER PROOF LOUVRE OPENEING 0.12m² FOR OUTSIDE AIR.

REQUIRED WEATHER PROOF LOUVRE OPENEING 0.24m² FOR OUTSIDE AIR.

REQUIRED WEATHER PROOF LOUVRE OPENEING 0.36m² FOR OUTSIDE AIR.

500X400 CLEAR ACCESSIBLE & UNISEX TOILET EXHAUST RISER TO ROOF.

1400x700 CLEAR CARPARK EXHAUST RISER TO ROOF.

800x400 CLEAR EXHAUST RISER TO ROOF. RISER SERVING FIRE SPRINKLER HYDRANT PUMP ROOM AND STORE ROOM.

REQUIRED WEATHER PROOF LOUVRE OPENEING 0.24m² FOR OUTSIDE AIR.

REQUIRED WEATHER PROOF LOUVRE OPENEING 0.45m² FOR OUTSIDE AIR.

REQUIRED WEATHER PROOF LOUVRE OPENEING 0.24m² FOR OUTSIDE AIR.

600X600 COMMERCIAL KITCHEN EXHAUST RISER TO ROOF.

COMMERCIAL KITCHEN MAKEUP AIR THROUGH BUILDING FACADE, ALLOCATE WEATHER POROF LOUVRE OPENING OF 1.35m² FOR OUTSIDE AIR.

MAKEUP AIR TO BASEMENT 1 THROUGH PERFORATED (70% FREE OPENING AREA) ROLLER SHUTTER.

GAS METER ROOM TO BE NATURALLY VENTILATED THROUGH LOUVRES ON FACADE.

400X400 CLEAR GARBAGE ROOM EXHAUST RISER TO ROOF.

REQUIRED WEATHER PROOF LOUVRE OPENEING 0.24m² FOR OUTSIDE AIR.

LOBBY TO BE NATURALLY VENTILATED VIA NATURAL VENTILATION TO BE MINIMUM 5% AREA

3200X1600 MECHANICAL PLANT SERVING FUNCTION ROOM AND KIOSK. PLANT TO BE ENCLOSED IN LOUVRES. ACOUSTIC TREATMENT SUBJECT TO ACOUSTIC REQUIRMENTS.

BOUNDARY
RL 11.225
6m REAR SETBACK (≤12m HEIGHT) DCP
4.5m FRONT SETBACK - DCP
6m SIDE SETBACK HABITABLE (≤12m HEIGHT) ADG/DCP
3m SIDE SETBACK NON-HABITABLE (≤12m HEIGHT) ADG/DCP
EXISTING DA OUTLINE LEVEL GROUND
LINE OF LEVEL OVER
LINE OF CARPARK BELOW
AWNING ABOVE
SETBACK
EXTERNAL DOUBLE PILLAR HYDRANT
GREASE ARRESTOR
AIR INTAKE
HOT WATER FLUE TERMINATE (3000MM ABOVE)
LOADING BAY/ VISITOR 1
LOADING BAY/ VISITOR 2
VISITOR/ SERVICES/ CARWASH
DAY RESPITE 4
DAY RESPITE 5
DAY RESPITE 6
DAY RESPITE 7
DAY RESPITE 8
DAY RESPITE 9
DAY RESPITE 10
KIOSK
BUILDING MANAGEMENT 145 m² RL 11.900
BUILDING MANAGEMENT 60 m²
BUILDING MANAGEMENT 50 m²
STAFF LOUNGE 35 m²
LOCKERS/ AMENITIES 10 m²
LOUNGE (RESPITE) 60 m²
CORRIDOR RL 11.900
TOILETS 10 m²
ACCESSIBLE WC 6 m²
UNISEX STAFF WC 10 m²
COMMS
RECEPTION 20 m²
UTILITY ROOM 10 m²
ACCESSIBLE WC 5 m²
LIFT
FIRE STAIR 1
FIRE STAIR 2
FS. PRES
HYD
CLEANER'S ROOM
LOBBY
STORAGE 10 m²
ACCESSIBLE WC 5 m²
KITCHEN 15 m²
STORAGE 5 m²
SAHF FUNCTION ROOM 30 m²
MAILBOX ROOM 10 m²
F/P/EWIS
GARBAGE ROOM 65 m²
CONDENSER FARM OVER RAMP (DOUBLE STACKED)
GAS METER 10 m²
WATER TANK5300L
SUBSTATION 15 m²
SUBSTATION SEGREGATION ZONE
GATE ENTRY
OUTDOOR SEATING AREA 35 m²
OUTDOOR LANDSCAPE AREA
TGSI'S PAVERS
1:19
1:20
1:8
1:4
RL 11.900
RL 11.420
RL 11.970
COMB. FIRE HYD/FIRE SPRINKLER BOOSTER ASSEMBLY
MECHANICAL PLANT FOR SAH FUNCTION ROOM & KIOSK
ACCESS COVERS
KIOSK 35 m²
SLEEP PODS 55 m²
DINING 30 m²
WATER METER
BOOSTER VALVE
MECHANICAL PLANT FOR STAFF LOUNGE/LOU (RESPITE)
MECHANICAL PLANT FOR DINNING, OPEN OFFICE, KITCHEN & SLEEP AREA.
CP EX
BRICK RETAINING WALL
BRICK UNITS MULTIPLE STORIES
BRICK BUILDING
SP76552
11.83
11.76
11.56
11.35
11.18
11.10
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10.92

1 GROUND LEVEL PLAN
1 : 100

NORTHUMBERLAND STREET

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Project Title
ANGLICARE - LIVERPOOL

Drawing Title
GROUND FLOOR GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	LMC
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2002	E

28/11/2018 10:46:31 AM

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PROJECT: ANGLICARE LIVERPOOL
MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
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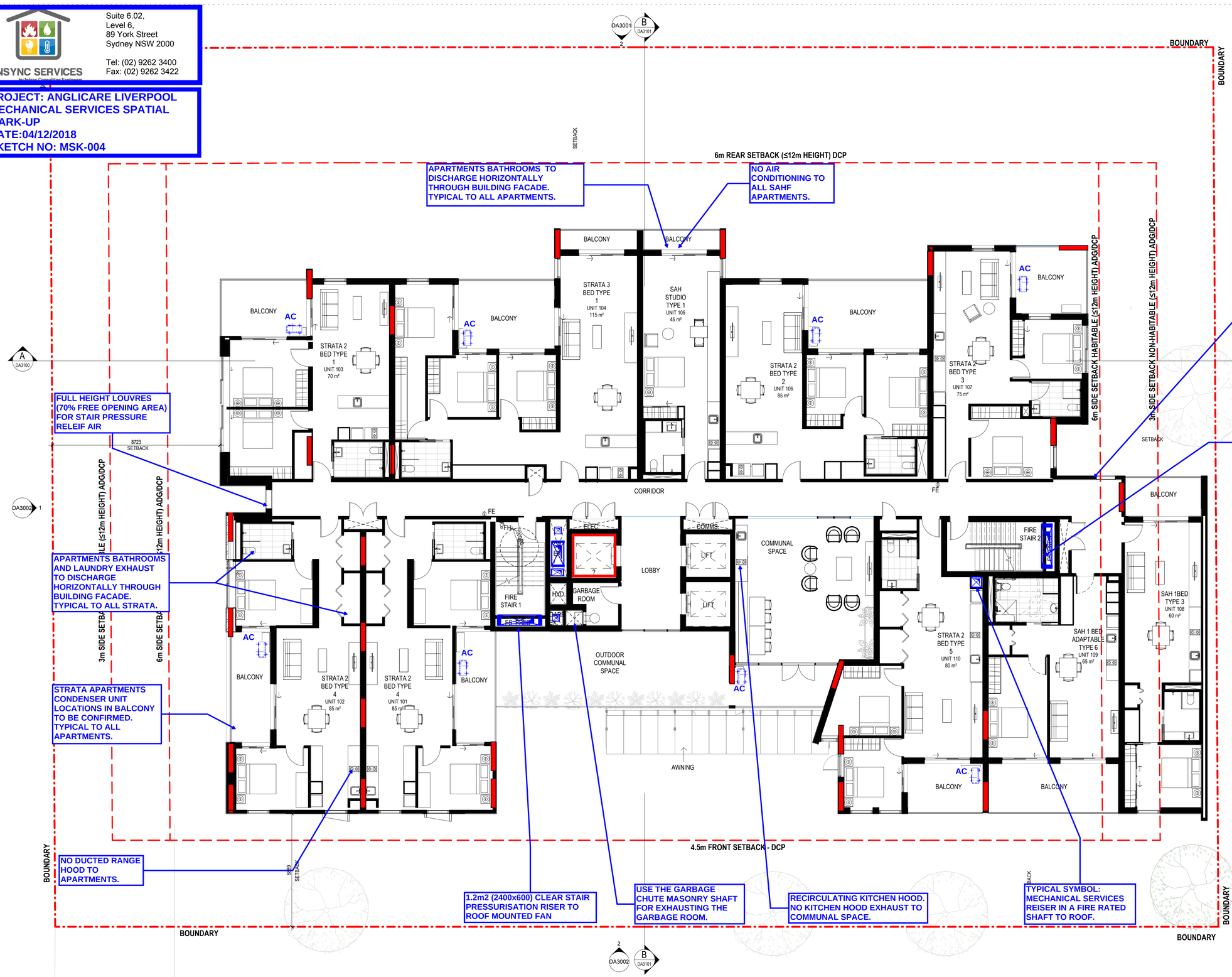

1 LEVEL 1
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Amendments

Issue	Description	Date
A	ISSUE FOR COORDINATION	14/08/2018
B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
D	ISSUE FOR INFORMATION	06/11/2018
E	ISSUE FOR INFORMATION	28/11/2018

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Project Title
ANGLICARE - LIVERPOOL

Drawing Title
LEVEL 1 GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	LMC
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2003	E

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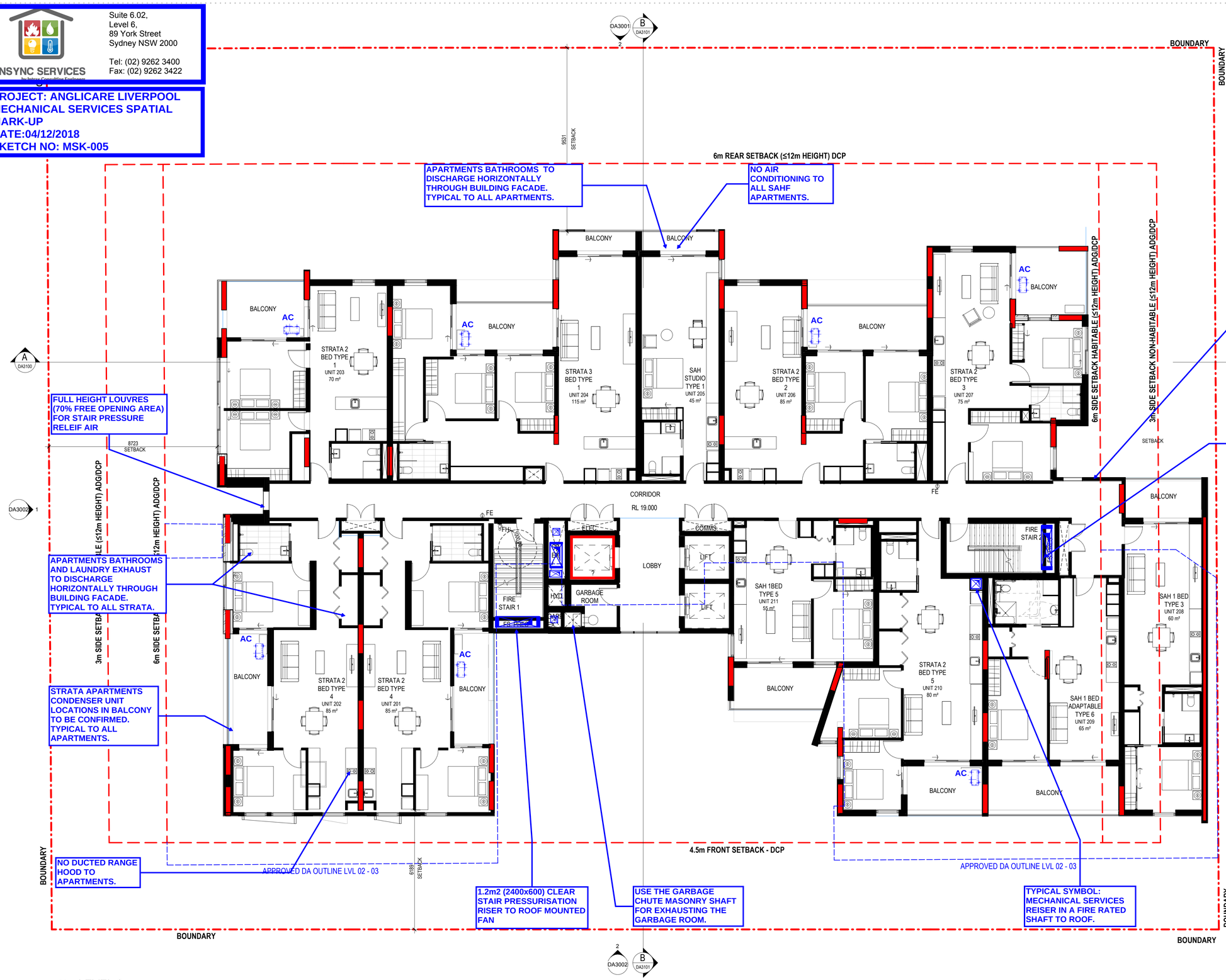
PROJECT: ANGLICARE LIVERPOOL
MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
SKETCH NO: MSK-005



1 LEVEL 2
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Amendments

Issue	Description	Date
A	ISSUE FOR COORDINATION	14/08/2018
B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
D	ISSUE FOR INFORMATION	06/11/2018
E	ISSUE FOR INFORMATION	28/11/2018

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Project Title
ANGLICARE - LIVERPOOL

Drawing Title
LEVEL 2-3 GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	LMC
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2004	E

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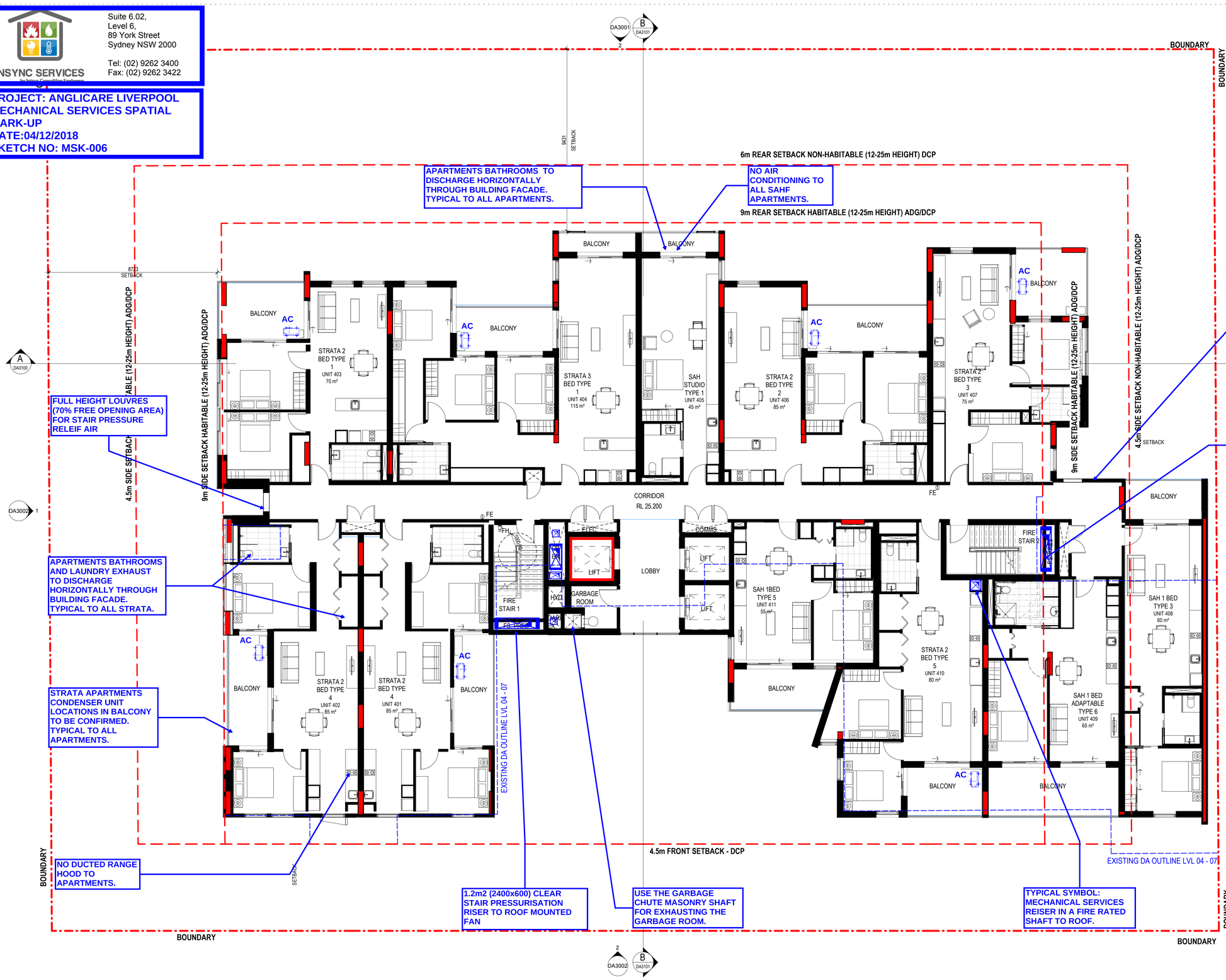
PROJECT: ANGLICARE LIVERPOOL
MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
SKETCH NO: MSK-006



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Amendments		
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B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
D	ISSUE FOR INFORMATION	06/11/2018
E	ISSUE FOR INFORMATION	28/11/2018

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Project Title
ANGLICARE - LIVERPOOL

Drawing Title
LEVEL 4 GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	LMC
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2005	E

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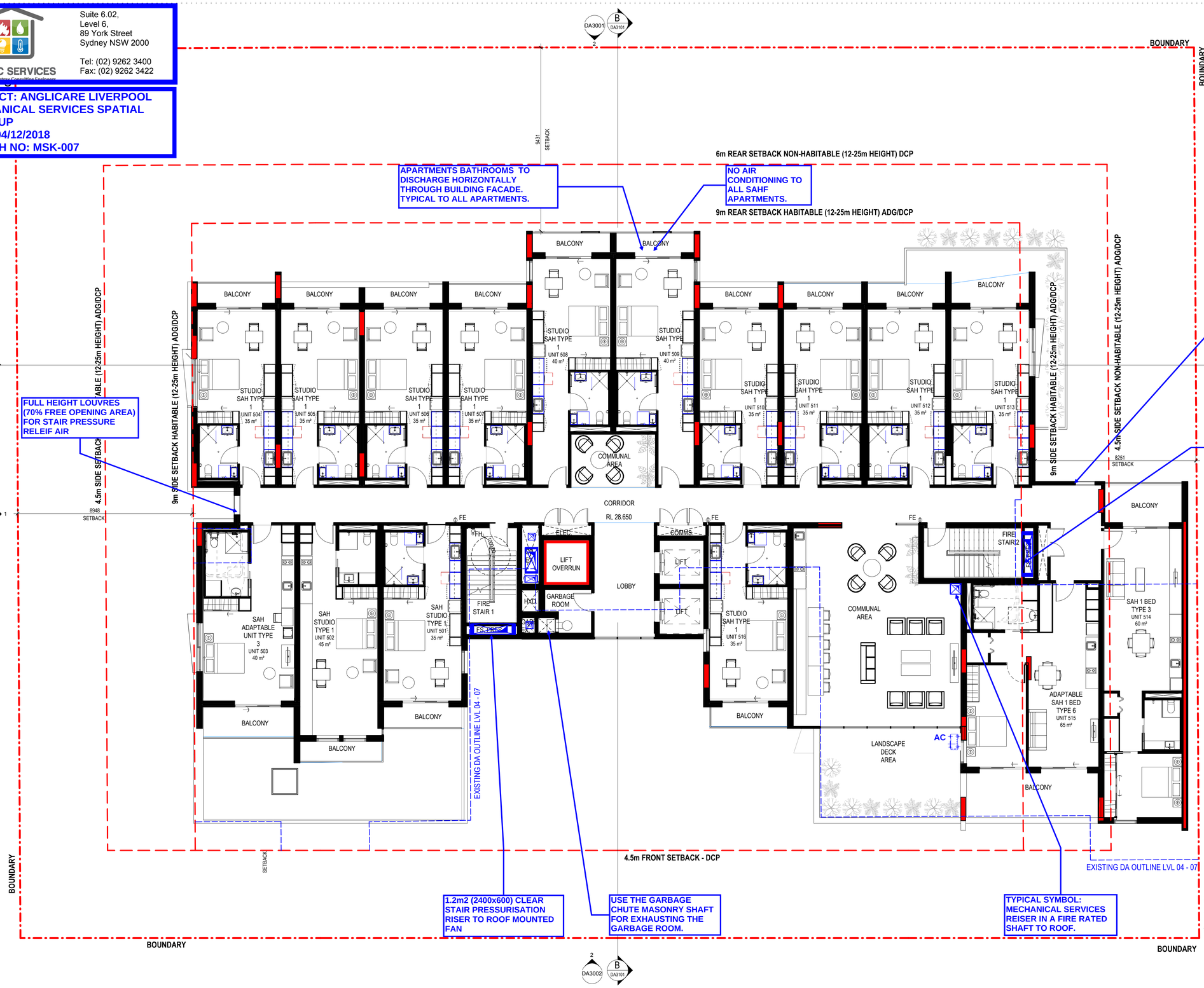
PROJECT: ANGLICARE LIVERPOOL
MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
SKETCH NO: MSK-007



1 LEVEL 5
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Amendments

Issue	Description	Date
A	ISSUE FOR COORDINATION	14/08/2018
B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
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E	ISSUE FOR INFORMATION	28/11/2018

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Project Title
ANGLICARE - LIVERPOOL

Drawing Title
LEVEL 5 GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	LMC
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2006	E

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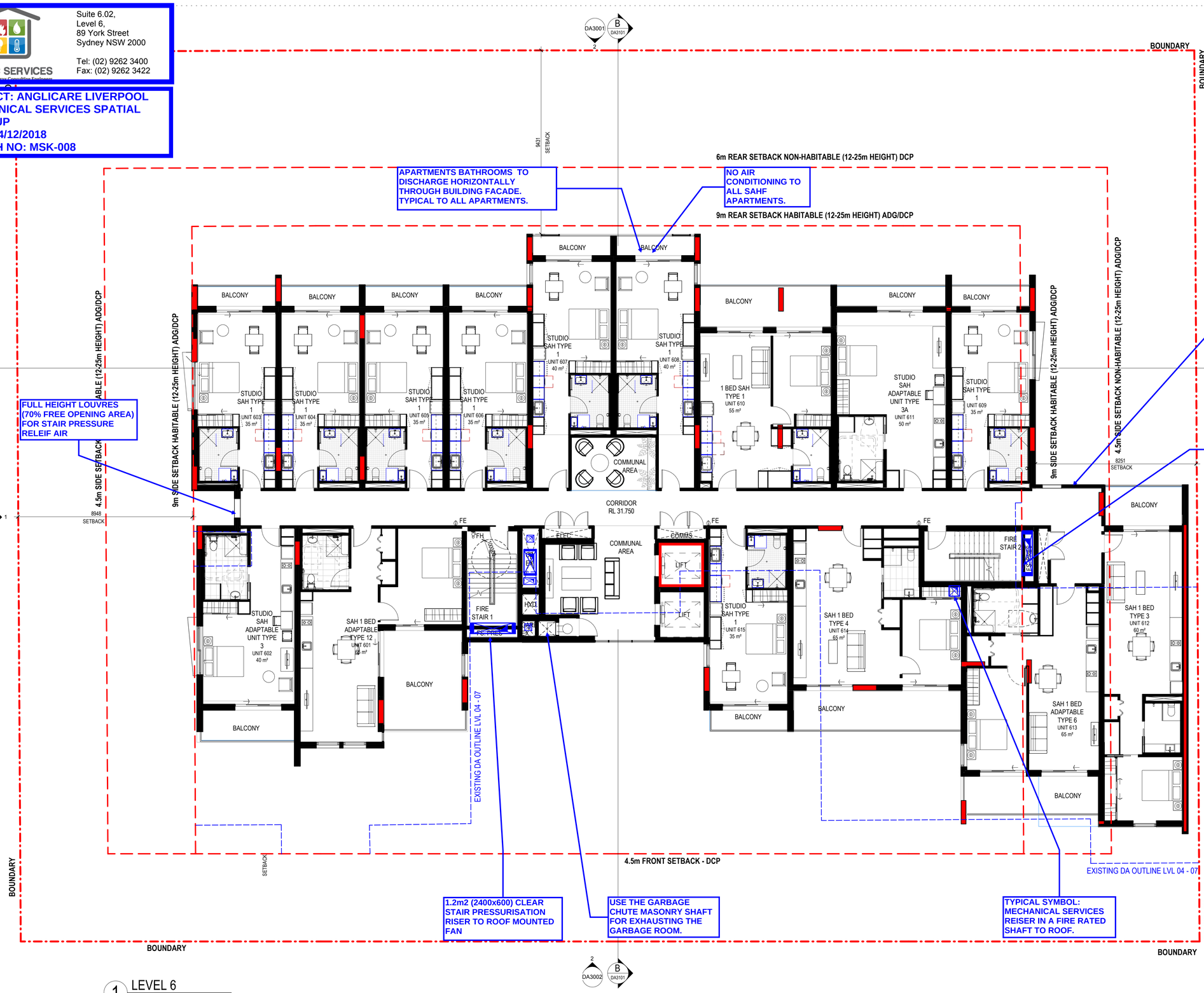
PROJECT: ANGLICARE LIVERPOOL
MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
SKETCH NO: MSK-008



1 LEVEL 6
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Amendments

Issue	Description	Date
A	ISSUE FOR COORDINATION	14/08/2018
B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
D	ISSUE FOR INFORMATION	06/11/2018
E	ISSUE FOR INFORMATION	28/11/2018

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Project Title
ANGLICARE - LIVERPOOL

Drawing Title
LEVEL 6-7 GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	LMC
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2007	E

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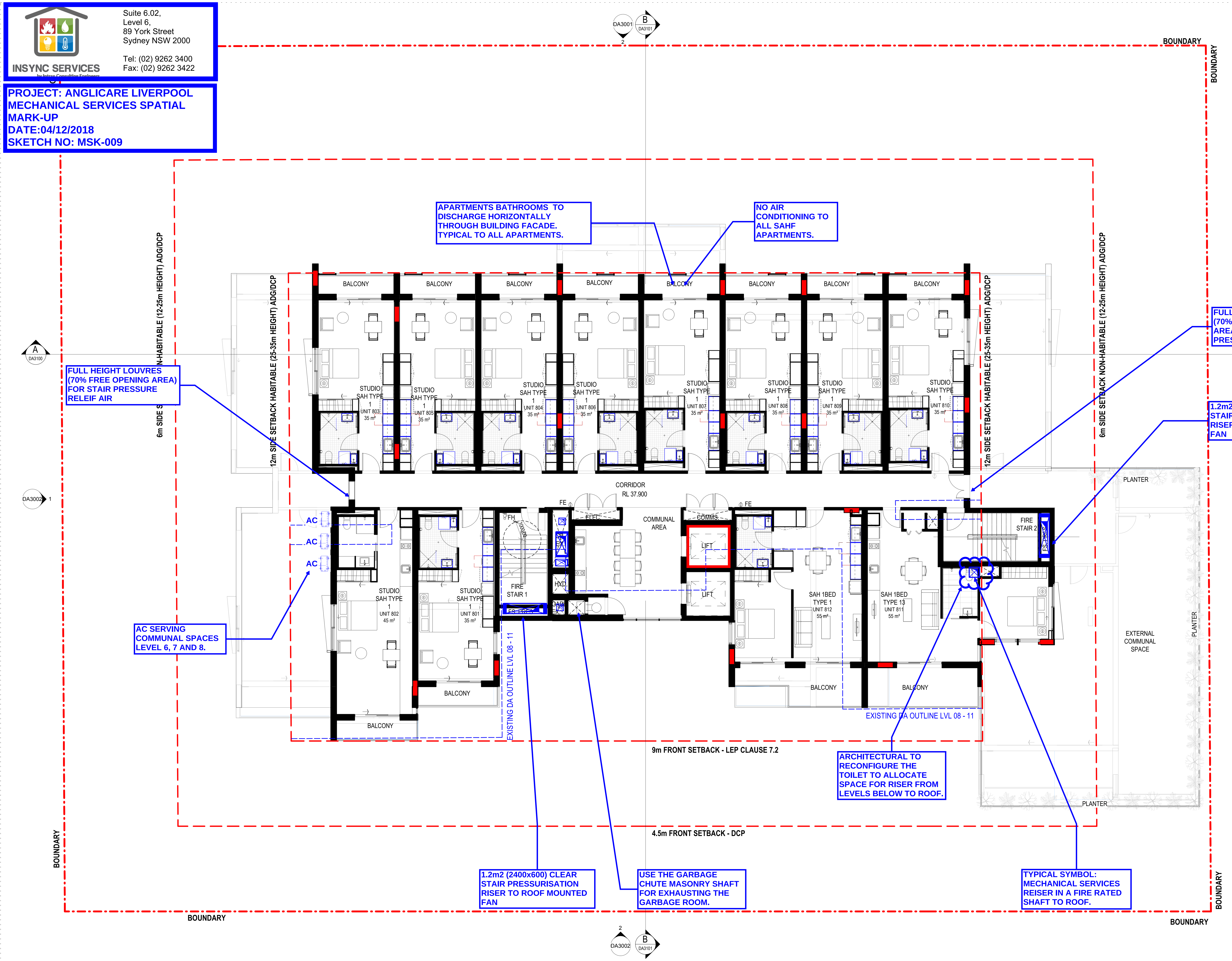
PROJECT: ANGLICARE LIVERPOOL
MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
SKETCH NO: MSK-009



1 LEVEL 8
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Issue	Description	Date
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B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
D	ISSUE FOR INFORMATION	06/11/2018
E	ISSUE FOR INFORMATION	28/11/2018

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architecture interior design urban design landscape
nom architect M. Sheldon 3990

Project Title
ANGLICARE - LIVERPOOL

Drawing Title
LEVEL 8 GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	LMC
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2008	E

28/11/2018 10:47:27 AM

INSYNC SERVICES
Suite 6.02,
Level 6,
89 York Street
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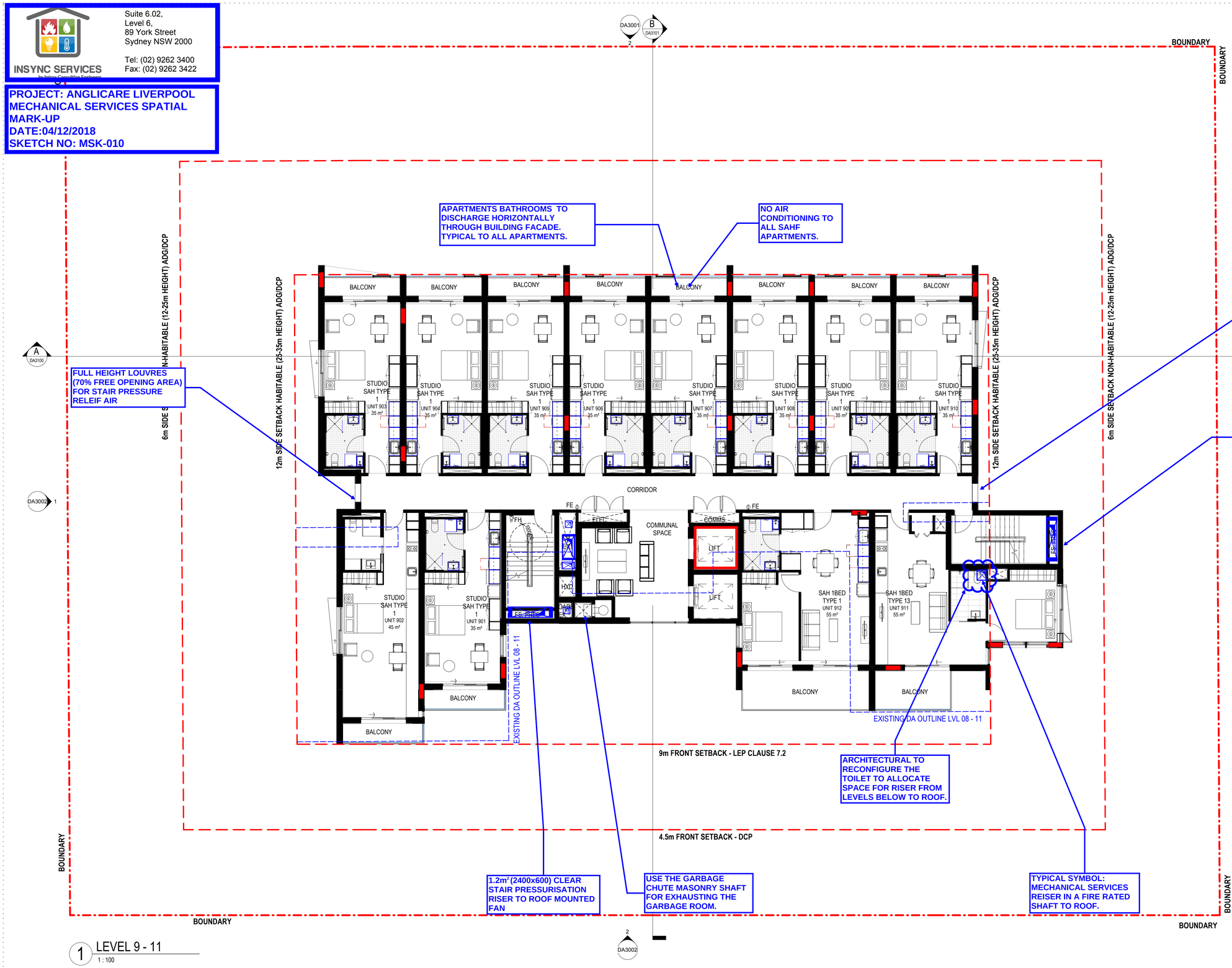
Tel: (02) 9262 3400
Fax: (02) 9262 3422

PROJECT: ANGLICARE LIVERPOOL
MECHANICAL SERVICES SPATIAL MARK-UP
DATE:04/12/2018
SKETCH NO: MSK-010



1 LEVEL 9 - 11
1 : 100

Amendments

Issue	Description	Date
A	ISSUE FOR COORDINATION	14/08/2018
B	ISSUE FOR INFORMATION	03/09/2018
C	ISSUE FOR INFORMATION	19/10/2018
D	ISSUE FOR INFORMATION	06/11/2018
E	ISSUE FOR INFORMATION	28/11/2018

North Point

DA SUBMISSION

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Project Title
ANGLICARE - LIVERPOOL

Drawing Title
LEVEL 9-11 GA PLAN

Scale	1 : 100
Drawing Created (date)	14/08/2018
Drawing Created (by)	MF
Plotted and checked by	Designer
Verified	MB
Approved	LR

Project No	Drawing No	Issue
180350	DA2009	E

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