EWFW
CONSULTING ENGINEERS

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1. INTRODUCTION

1.1. PURPOSE

This document is to form the basis of the design for works by EWFW. We are providing Mechanical, Electrical, Fire and Hydraulics consulting services.

1.2. SITE LOCATION

Figure 1.1 – Site is located at 26 Elizabeth Street, Livepool

1.3. GOVERNING AUTHORITIES

The following Governing Authorities and Regulations shall have jurisdiction over the Building services:

Authority/Code
Liverpool Council
Building Code of Australia (BCA) - 2016
The Plumbing Code of Australia

Authority/Code
Jemena
AS3000 Wiring Rules
Service and Installation Rules of New South Wales (Service Rules)
Endeavour Energy
Australian Communications and Media Authority (ACMA)
Department of Fair Trading (NSW)
Australian Standards adopted by the BCA and State Legislation as applicable to each discipline

Table 1.1 – Authorities and codes

1.1. AUTHOR DETAILS

EWFW Pty Ltd
Level 4
362 Kent St
Sydney NSW 2000

Author: Jamie Guajardo – Fire Team Leader

Reviewer Dominic De Gioia – Director

1.2. DISCLAIMER OF LIABILITY

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2. BASIS OF DESIGN

The proposed re-development is located at 26 Elizabeth St Liverpool, Liverpool, NSW.

The project consists of the following:

- Basement level car parking level/s
- High rise Residential
- Mid-Rise Commercial levels
- Low rise Retail and similar tenancies

2.1. SCOPE OF SERVICES

The scope of services addressed in the report, include the following:

Hydraulic Services

- Sanitary drainage
- Potable water services
- Hot water services
- Non potable water services
- Gas services
- Trade wastewater
- Interface point for irrigation (irrigation design by others)
- Backflow prevention requirements
- Stormwater systems
- Rainwater systems
- Subsoil Drainage
- Fire hose reels

Wet & Dry Fire Services

- Fire detection and alarm system
- Fire Indicator panel network
- Sound System and Intercommunication System for Emergency Purposes.
- Fire extinguishers and blankets
- Wet pipe fire sprinkler and hydrant system
- Drencher sprinkler system (if required)

Electrical & Communication Services

- Interior and exterior building lighting
- Emergency and exit lighting
- Low voltage power infrastructure including main switchboards and distribution boards
- Supply authority and private metering energy provisions
- Lightning protection
- Power factor correction equipment
- Power outlets (as required) and supplies to equipment by others
- Voice and data communications infrastructure
- Comms to equipment (equipment by others)
- Free to air and pay TV systems
- Access control and intruder detection systems including intercoms
- CCTV systems

Mechanical Services

- Air-conditioning including grilles and ductwork.
- Standalone systems for open plan tenancy if required due to planning density.
- Supplementary mechanical ventilation systems as required.

- Supply and return air distribution systems as required.
- Base building control systems as required including relocation of thermostats.
- Electrical services associated with above systems.
- Lifts

Note the following items have not been included in our scope:

- Liaison with NSW Fire Brigade or any Brigade submissions
- Section 73 submission
- Plan Stamping using tap in (if referred to a Sydney Water coordinator an extra fee will apply)
- “Notice of Requirements”, works, fees or charges
- Authorities’ liaison, applications, fees or charges
- Authorities’ mark outs
- Project management or work related with upgrade works to authority mains
- Submission of drawings for approval with authorities
- On-site surveys, site plans and survey drawings (including provision of survey drawing indicating contours and existing site services with invert levels)
- Structural design of any stormwater and rainwater tanks
- Stormwater external catchment and overland flow flooding analysis
- Hydrological report with respect to the impact of underground water flows, if required
- Diversions / extensions / amplifications of authorities or site services mains
- On site detention and rainwater tanks calculation
- Fitout of the office (Base building design only)
- 3D Design
- Authorities’ fees, charges and disbursements for preparing headworks proposals, undertaking investigations and services locating by contractors.
- Acoustic engineering services (by Acoustic Consultant).
- Home Automation. EWFW would liaise with proposed Home Automation / AV Specialist and provide power, data, comms and TV Services to suit.
- OH&S and hazardous materials and DDA consultancy services (by OH&S/DDA consultants).
- As-built drawings including coordinated workshop drawings and construction details
- Certification of the constructed works. EWFW Consulting would provide a certification statement stipulating the relevant Codes to which the building services systems are designed. The Contractor and Building Surveyor would then certify the installation.
- Formal Green Star or NABERS review or ratings.
- ESD including; Energy audits or alternate solutions via modelling.
- Section J Assessments
- Fitout of the office (Base building design only).
- 3D Design
- Telco authority infrastructure design
- Fibre to the premises design
- Intelligent lighting controls
- Audio visual design
- Comms active equipment design
- Demolition plans or design
- Preparation of bills of quantities
- Preparation of IT briefs
- Retail/café/food/commercial tenancy fitout on ground floor or elsewhere – cold shell provisions only if required
- Public address system design
- Pool lighting design
- Standby power design
- Trigen or cogen design
- Photovoltaic design
- UPS design

- Pedestrian traffic management system
- Carpark traffic management system

3. BUILDING SERVICES

3.1. BUILDING DRAINAGE SYSTEM

System Description

The building drainage system shall extend from the base of stacks and fixtures from Ground to the authority sewer that is located on through the property. A connection to an existing sewer sideline will be required with a new boundary trap at the connection to the main. All existing drainage systems that are to remain live will be connected into the new drainage system and redundant systems will be removed and capped back the main drainage system.

Currently there is a sewer main that extends through the property to serve all the existing lots, however as these lots are being combined into one lot the need for this service is no longer required. Consultation with Sydney water will be required to remove and cap off the existing authority main. From this capped off main a new connection will be connected to the existing sewer main as the main sewer drainage for the site. This is all pending Sydney waters notice of requirements.

The system will connect to the authority main complete with a boundary trap over flow relief gully and in-duct mica flap.

In the basement levels where there will be sanitary drainage requirements and areas that are unable to be drained by gravity, a pump-out system will be employed. The pumps will be macerator type, which will pump to the authority main at the rate permitted by the authority. The pumps will be duty standby to ensure that if one pump fails, a backup is capable of removing the waste. If a pump fails a “non-contact/failure” alarm will activate in the area of the sewer pump pit. Through the nurse call or BMS type system, the pump failure will appear on a nominated computer terminal, alerting the appropriate person(s) to arrange a callout to repair the fault in the system. We envisage that the levels above ground floor on this site will drain entirely by gravity.

Each bathroom will be able to be cleared of blockages from within the bathroom space. Clearouts will provided for all rooms within the room.

Materials

The materials used for the system shall be as follows:

a) Drainage pipes – uPVC, HDPE or light weight cast iron.
b) Pump Chamber – Concrete (in Situ).
c) Manholes – Concrete (Precast).

3.2. TRADE WASTE DRAINAGE SYSTEM

A Trade Waste drainage system shall be provided to all tenancies and food type areas. The trade waste drainage system shall be located at high level under the ground floor slab and in ground this shall discharge to basement pumping station or location that is suitable for the installation. The final location will be confirmed throughout the design phase.

Materials

The materials used for the system shall be as follows:

a) Pipe - HDPE or light weight Cast Iron.
b) Grease Arrestor – Fibreglass complete or cast insitu

3.2.1.Grease arrestor

The grease arrestor shall be sized to cater for the following loadings as nominated by New South Wales Trade Waste requirements:

- Restaurant seating numbers as nominated in Liquid trade waste guide lines.
- If seating numbers cant be provided than the size shall be based a minimum 1000L per tenancy grease arrestor.

The outlet from the grease arrestor shall discharge to the house drainage system to basement.

Final location of the grease arrestor shall be coordinated with the architect and client. Currently we have nominate the location to be in the basement and as this location is not accessible by a pump out truck, a pump-out line from the grease arrestor to an accessible location will be installed for ease of maintenance when the truck has to empty the arrestor.

Vent pipes extending from the trade waste drainage system and grease arrestor shall extend up through the building to discharge at roof level in accordance with AS3500 and Sydney Water requirements.

3.3. POTABLE COLD WATER SYSTEM

System Description

The potable cold water reticulation shall extend from the 150mm SWC water main in Elizabeth dr. The pipe will enter the property and connect to the authority water meter at Ground Level in the landscaped area on the Elizabeth dr. entry (pending final approval). The meter will be required to have an RPZD installed directly after the meter. From the meter it travels in basement to the pump room to be pressurized for domestic usage.

A separate water supply shall also extend from the authority main to the booster enclosure and terminated with a table “E” flange. This is then connected onto by the fire contractor.

Control/isolation valves will be located generally in the ceiling space behind access panels to the ensuites.

Materials

The materials to be utilised in the system shall be as follows:

a) In Ground Reticulation –Medium Density Polyethylene.
b) Main Reticulation within the Building – Type B Copper Tube.
c) Rough In Reticulation – Cross Linked Polyethylene, Polypropylene, Polybutylene.

Flow Control

The potable cold water to all tapware shall be controlled to significantly reduce the permissible water flow from the outlets. Flow rates for the various fixtures and associated tapware shall be:

a) Basins – 6 litres/minute.
b) Sinks – 9 litres/minute.
c) Showers – 9 litres/minute.
d) Baths – 12 litres/minute.

3.3.1.Site Facilities

The reticulation for the site shall extend from the authority meter assembly to the commercial facilities with the following services being provided:

a) Garbage area – isolation valve and meter
b) Core amenities– isolation valve and meter
c) Retail tenancy – isolation valve and meter

20mm isolation valves being provided to each service area are to be located in the ceiling space of every floor level.

The Parking Level and all levels of the towers will require fire hose reels facilitated by the potable water system. The branch isolation valve must be kept locked open at all times servicing the fire hose reels and any other control valve between the meter assembly and the fire hose reel. A lockable isolation valve will also be required at the authority meter.

3.4. POTABLE HOT / WARM WATER SYSTEM

System Description

The central hot water plant for the base building shall be a gas instantaneous system with storage vessels. The system that will be specified will be the Rotex system as the system efficiencies will ensure that minimal requirements of gas is required to facilitate the usage during peak periods

The potable hot water reticulation system will extend from the central hot water plant located in the plant room and then reticulate through the building adjacent to the potable cold water reticulated supply. This vertical riser will then return to the central local system to be reheated to above 62.5°C.The hot water loop will designed as continuous with short dead leg branches to the bathrooms and service areas. This will eliminate the need for balancing valves that require ongoing servicing for to ensure that the system is evenly distributing hot water to the facility.

Each branch will have a control valve so that each area is able to be independently shut down when servicing or isolation is required. To ensure that the water is kept at the correct temperature, the entire system will be lagged as per Australian Standards and BCA requirements.

Hot Water Reticulation Heat Loss

The entire main reticulation system will be lagged to reduce heat loss from the system as per code requirements.

3.4.1.Materials

The materials used for the system shall be as follows:

a) Main Reticulation within the Building – Type B copper
b) Rough In Reticulation – Cross Linked Polyethylene, Polybutylene.

3.4.2.Flow Control

The potable hot/warm water to all tapware shall be controlled to significantly reduce the permissible water flow from the outlets. Flow rates for the various fixtures and associated tapware shall be:

a) Basins – 6 litres/minute.
b) Sinks – 9 litres/minute.
c) Showers – 9 litres/minute.
d) Baths – 12 litres/minute.

3.5. FIRE HOSE REEL SYSTEM (WHERE REQUIRED)

System Description

The fire hose reel system will extend from the potable cold water reticulation system with dedicated service pipes connecting to fire hose reels. Confirmation of the classification of the carpark areas will determine the need for hose reels within this area.

3.5.1.Materials

The materials used for the system shall be as per the potable cold water reticulation.

3.6. NATURAL GAS SYSTEM

System Description

The natural gas service shall extend from the Authority Gas main located in Elizabeth dr.to the main meter assembly located in the gas meter enclosure. The gas pressure shall be 7kPa (to be confirmed via discussion with the utility operator).

The gas reticulation shall extend from the meter/regulator assembly through the ground floor to serve the required gas fixtures

A regulator will be positioned out the front of the site. The cafe area and central plant are separately metered.

Tenancies

Capped of gas points at high level shall be provided to all tenancies for future connection by tenant

3.6.1.Materials

The materials used for the system shall be as follows:

a) Main Type B Copper Tube.
b) Rough ins may be in other tested and approved pipe systems ie PEX-AL-PEX.

3.7. ROOF WATER DRAINAGE

System Description

The roof drainage system shall extend from the roof areas of the building, discharging to the civil system provided around the building. A portion of the roof will drain to the rainwater storage tank located on the Parking Level.

The rainwater will be generally captured via rainwater outlets and downpipes.

Downpipes to collect rainwater from roof levels of the development have been allowed to drain each roof using the following ARI rainfall intensities;

Eaves gutters sized to the 1 in 20 year storm event.

Box gutters sized to the 1 in 100 year storm event.

Flat roof areas sized to the 1 in 100 year storm event.

Balconies, flat roofs and hard stand areas will be documented with rainwater outlets. Overflows through the facade of the building will be required on the balconies/terrace and flat roof areas in case

the rainwater outlet blocks. This will not be required if there is a gap between the balcony/terrace floor and the balustrade.

A rainwater tank location is still to be advised.

An overflow from the rainwater storage tank shall be provided to discharge to the stormwater system.

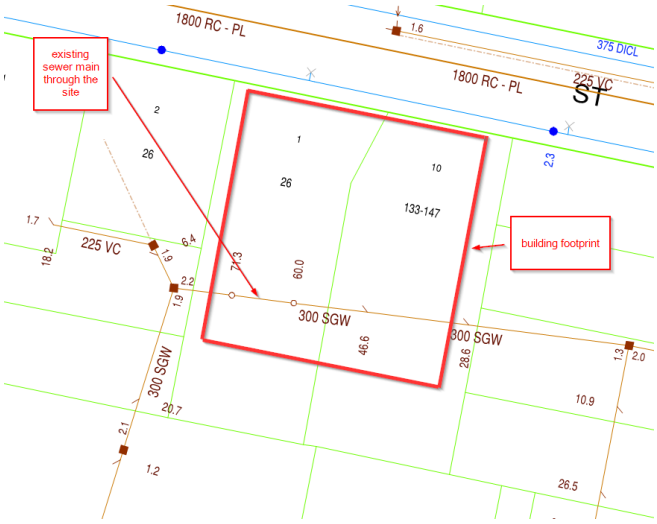
3.7.1. Materials

The materials used for the system shall be as follows:

a) uPVC pipe and fittings with the downpipes being insulated with acoustic lagging where required.

b) HDPE for downpipes located inside columns

3.8. SYDNEY WATER SEWER RE-DIVERSION



The 300mm sewer main that currently traverses through the site will need to be addressed prior to works commencing on site. This may include rediverting the sewer main or building over. Final requirements will be dictated from Sydney Water

3.9. FIRE PROTECTION SERVICES

3.9.1. Combined Fire Sprinkler/Fire Hydrant System

System Description

The Combined Fire Sprinkler/Hydrant System shall extend from the Sydney Water main in Elizabeth Street. The pipe will enter the property and connect to the authority water meter assembly at Ground Level. This assembly shall incorporate a double detector check valve with metered bypass (as required).

After the backflow prevention device a branch from the main line will direct water to the combined fire sprinkler/hydrant booster assembly. The combined fire sprinkler/hydrant booster cupboard won't be visible from the main vehicular entrance of the building and but will be at the primary pedestrian entry.

The proposed location of the brigade booster assembly shall require a FER for compliance as the assembly was not within site of the vehicular entry of the new building; to be confirmed with the PCA.

Refer to Appendix A for details on fire rating requirements.

We have not received the pressure and flow information from Sydney Water; we are assuming that it will be insufficient for the Combined Fire Sprinkler/Hydrant System to operate without a pump set; therefore two (2) diesel pump sets shall be provided to pressurize the system.

An additional Fire Brigade Relay pump shall be installed to pressurise the combined sprinkler/hydrant system over 40m in height.

A combined fire sprinkler/hydrant tank shall be required; this shall require an effective capacity of 120,000L.

The Fire Sprinkler system control valves sets shall be mounted in each fire stair on each level, this is as per the requirements of AS2118.6-2012.

External Fire Hydrants shall be installed at access points (if required) and complementary internal fire hydrants to be provided on the upper level to allow sufficient fire coverage to the building.

Isolation valves shall be monitored and installed in accordance with AS2419.1

3.9.2. Automatic Fire Detection and Alarm System

An addressable smoke detection system will be provided throughout the entire building. An addressable Fire Indicator Panel (FIP) shall be installed within the site main entry lobby and additional.

Smoke detectors shall be installed in all rooms and corridors throughout the building in accordance to AS 1670.1. Thermal detectors shall be used in areas where the installation of smoke detectors may lead to false alarms.

All devices will be mounted on the ceiling and connected via TPS 24Vdc cabling back to the FIP. An alarm strobe will be located outside the main entry to the building.

3.9.3. Sound System and Intercom Systems for Emergency Purposes (SSISEP) / Emergency Warning and Intercom Systems (EWIS)

An Emergency Warning and Intercom System/Sound System and Intercom System for Emergency Purposes (EWIS/SSISEP) shall be provided throughout the building. The system will make use of horns and ceiling mounted speakers along with manual call points.

The EWIS/SSISEP panel is the located adjacent the building FIP at the main building main entry lobby. Sub-MECP shall be located in the secondary building lobby.

WIP shall be located at Exit/Egress points as required under AS1670.4-2015; note this element is above the NCC requirements.

Any triggers to the fire sprinkler system or the automatic smoke detection system shall notify the local fire brigade via an alarm signalling equipment.

3.9.4. Fire Extinguishers

Fire extinguishers will be located throughout the building in cupboards with signage as required. Extinguishers will be located along egress paths.

Kitchens will be protected with both extinguishers and a fire blanket.

Significant switchboards will be protected.

On the upper residential levels fire extinguisher shall be required to be installed within 10m of all SOU entry doors. This will be reflected as indicative locations in the spatials. The final locations shall be coordinated with the architect.

These fire extinguishers can be located in services cupboards or be exposed wall mounted types.

3.10. MECHANICAL SERVICES

3.10.1.General

Preliminary spatial information has been provided for two air conditioning and ventilation options for the development. The two options provided are a water cooled Variable Refrigerant Flow (VRF) system and an Air Cooled VRF system with split system air conditioning to apartment. The two options are explained below and preliminary spatials are provide for comparison.

The purpose of this draft report is to get feedback from the client on the direction to proceed. Once feedback has been made on the air conditioning and ventilation, spatials can be further developed.

3.10.2.Air conditioning – Retail and Commercial spaces

Common areas within the building shall be provided with air-conditioning via ducted type fan coil units. The fan coil units shall be connected via refrigerant pipework to outdoor reverse cycle Variable Refrigerant Flow (VRF) condensing units. The condensing units will be located in centralised plant zones. Heat recovery VRF will be considered on a system by system basis.

Condenser units will be located to ensure the maximum pipework runs are not exceeded.

Condensing units will be air cooled or water cooled.

3.10.3.Residential Air conditioning - 1to1 split option

Apartments will be conditioned via reverse cycle split systems encompassing an indoor unit (wall mounted, bulkhead or ducted), fan coil unit and external condenser connected with refrigerant pipework. Each apartment air conditioning system will comprise of the following;

- Wall mounted control panel incorporating on/off, temperature, fan speed and time clock as a minimum;
- Condenser mounted on wall outside room or on the roof;
- Outside air will be provided via operable windows and make-up air system;

Advantages

- Stand alone system per apartment. Low cost to replace individual systems as they come to the end of their lifecycle;
- Units can be replaced without disruption to the rest of the floor;
- Low capital expenditure;

Disadvantages

- Condensers need to be within 15m of the indoor unit. Located on the balcony typically;
- There may be issues with acoustics when condensers are directly outside doors/windows;
- Less efficient than VRF;
- 7-10 year life expectancy;
- Possibility or greater maintenance costs;
- Condensers on the facade can be unsightly;

Fig – 4.1 – 1 to 1 split with bulkhead unit

3.10.1.Residential Air conditioning – Water cooled VRF option

Apartments will be conditioned via reverse cycle split systems encompassing an indoor unit (wall mounted, bulkhead or ducted) connected to a water cooled condenser that will serve the entire floor. The condenser units will reject heat to a condenser water loop running through the building and connected to closed circuit cooling towers on the podium level. The air conditioning system will comprise of the following;

- Fan coil unit in apartment;
- VRF condenser located in the corridor
- Closed circuit cooling towers on podium levels 3&4;
- Interconnecting condenser water between condensers and cooling towers;
- Interconnecting refrigerant pipework between condensers and fan coil units
- VRF Heat recovery units can provide heating and cooling simultaneously

Advantages

- Longer economic lifecycle than 1 to 1 split systems. 10 to 15 years for VRF. 20-30 years condenser water system
- Central location for external plant;
- Heat recovery makes for an energy efficient system
- Higher efficiency than 1 to 1 split systems;

Disadvantages

- Locating large central plant.
- Centralised plant may be noisier and require acoustic treatment;
- More expensive than 1 to 1 splits;
- Single point of failure (condensers) can potentially leave an entire floor without air conditioning;

3.10.1.Car park ventilation

The car park shall be provided with supply and exhaust ventilation as indicated on the preliminary spatial plans. A suitable exhaust discharge location shall be provided at podium level 1 to avoid running a large riser up through the building and using up valuable NLA.

3.10.1.Lobby ventilation and air conditioning

The lobby will be conditioned with a dedicated constant volume system. The system will be a stand alone AHU or fan coil units depending on the chosen option (WVRF or AVAV).

3.10.1.Retail ventilation and air conditioning

The retail areas require further consideration before an air conditioning system is selected. The flexibility required for this space needs to be discussed in further detail.

3.10.2.Smoke management

A smoke management system will be designed as per AS1668.1 and BCA 2016 requirements.

3.10.3.Lifts

Preliminary lift studies indicate that 4 – 5 lifts are quired for the residential tower and at least 2 lifts will be required for the commercial areas

3.11. ELECTRICAL SERVICES

3.11.1.Power Supply

An application for connection of load will be required to be submitted to Endeavour Energy (EE). The application response will determine if the site can be powered by either multiple padmount substations or multiple chamber substations.

The maximum demand will be provided when an application for connection is lodged with Endeavour Energy (EE) in due course.

Power supply spare capacity to be confirmed with client.

3.11.2.Standby Power

Standby power provisions are to be confirmed with client.

3.11.3.UPS Power

Rack mounted UPS units will be provided for base building security head-end equipment.

No other UPS provisions will be made at this stage.

3.11.4.Consumers Mains

The consumers mains cabling entering the building will be fire-rated and will have a maximum permissible voltage drop of 1%. It will be rated to building maximum demand.

3.11.5.Main Switchboard (MSB)

A Form 3B, IP42 rated main switchboard will be established in the main switchroom. The main switchroom will be air-conditioned and be of 2-hour fire-rated construction. The room will require two outward opening doors (fire-rated and spaced well apart) for access and egress from the switchroom. One door will be a double door for equipment access.

Major tenants may be bulk metered in the MSB subject to confirmation of floors to be occupied and integration with the base building design and construction program (TBC).

The main switchboard will be rated in accordance with the prospective fault level imposed by the substation and the consumers mains size. It will have 25% spare capacity (TBC) on busbars for future circuit breakers. Circuit breakers will be used throughout to achieve discrimination with upstream and downstream protection.

From the main switchboard, power will be distributed to house services distribution boards (DBs), tenant switchboards, mechanical services switchboards, lifts, hydraulics and fire services.

3.11.6.Protective Earthing

The earthing system for this installation is the M.E.N. as detailed within AS3000. All submains and final sub-circuits will be earthed in accordance with the requirements of AS3000. All exposed metal work of electrical equipment or parts thereof will be connected to earth in an approved manner.

3.11.7.Power Factor Correction

Power factor correction equipment will be provided within the main switchroom to correct the building power factor to a minimum of 0.9 lagging.

3.11.8.Submains

Submains off the MSB will be provided to the following:

- House light and power DBs.
- Apartment tenant meter panels.
- Retail and/or commercial tenant meter panels on ground floor and podium levels

- Mechanical services switchboards
- Hydraulics services panels
- Fire services panels
- Lift services panels

No spare capacity will be provided on submains (TBC). The submains will conform to AS3000 and AS3008.1.1 with a maximum permissible voltage drop of 2%.

Submains to BCA non-essential loads shall be V90 XLPE types. Submains to BCA essential loads will be 2-hour fire-rated types.

Submain cables shall be reticulated on cable ladders / trays to their respective loads where applicable, within dedicated fire rated risers and electrical cupboards. House services will be reticulated in one cupboard. The other cupboard will be for tenant services.

House and tenant DBs (including meter panels) will be supplied by fused tee-off boxes located in electrical riser cupboards. Each house light and power DB shall serve 1 floor on the retail/commercial levels and 3 floors on the apartment levels.

Supplies to retail and commercial tenant light and DBs will be rated to the requirements of AS3000 Table C3. Supplies to apartment light and power DBs will be rated to EE requirements.

Individual submains will be provided to other services boards/panels.

3.11.9.Distribution Boards

Distribution boards are to be Form 1 type construction to AS3439 and will be provided to service the following centres of load:

- House services light and power
- Each apartment
- Retail and/or commercial tenants on ground floor and podium levels

Each distribution board will be rated to the supplying submain and equipped with a main switch, miniature circuit breakers for final sub-circuits and will be located to the requirements of AS3000. The house and tenant light and power switchboards will be split chassis with lighting and power sections to be separately metered (except apartment DBs).

All distribution boards will be located inside electrical cupboards or in plant rooms. Apartment DBs will be located not more than 2000mm to top AFFL within apartments.

House light and power DBs will be minimum 36 pole capacity. Pole requirements for tenant light and power DBs will be based on 1 pole per 15m2 NLA. Apartments will be provided with 24 pole DBs (not split chassis).

Distribution boards will be provided within the retail and/or commercial tenancies on ground floor with a main switch only.

Residual current devices will be provided on final sub-circuits to comply with the requirements of AS3000.

3.11.10.Metering

Meters and metering arrangements shall comply with Endeavour Energy rules and regulations as well as the NSW Service Rules.

Metering of house services will be provided within the MSB.

Metering of tenant light and power services will be provided by meter panels located within the tenant electrical riser. Meter panels for retail/commercial floors will be designed to meter up to 4 tenants per floor (TBC).

Each metering panel shall serve 1 floor on the retail/commercial levels and up to 3 floors on the apartment levels.

Private energy metering will be provided to separately monitor the following load groups:

- House light and power
- Tenant light and power (retail, commercial and apartments)
- Lifts
- Mechanical plant
- Central hot water plant
- Any additional item which is rated greater than 100 kVA of load.

3.11.11.Power outlets

House Areas

General purpose outlets (GPOs) in all house areas will be Clipsal C2000 series (white). Cleaner's outlets will be provided at all lift lobbies and front of house areas on ground floor. Amenities will also be provided with power outlets above benches/basins at each end of bench.

Client to confirm if skirting duct mounted cleaners' outlets are required on perimeter of commercial office levels as part of base building works.

Weatherproof outlets (Clipsal 56 series IP65) will be provided as required externally and within each plantroom/store room.

Weatherproof outlets will be provided in each carpark level. They shall be located at 1800mm above floor level to avoid mechanical damage from vehicles.

No outlets will be provided to retail and/or commercial tenancies on ground floor.

Apartments

General purpose outlets equivalent to Clipsal Saturn Series (TBC) will be provided as generically identified below. Outlets will be provided in accordance with the following schedule and as located on the architect's detailed dimensioned drawings:

Kitchen	Dishwasher – 1 single GPO Refrigerator – 1 single GPO Microwave – 1 single GPO Range hood – 1 single GPO General – 3 double GPOs Gas Cook Top – 1 single GPO Oven – 1 permanent connection Exhaust fan permanent connection controlled by run-on timer (TBC)
Bathroom	1 double GPO per vanity Heated towel rail permanent connection (TBC) Floor heating permanent connection (TBC) Exhaust fan permanent connection controlled by run-on timer
Laundry	Washing machine – 1 single GPO Dryer – 1 single GPO

	General – 1 double GPOs Exhaust fan permanent connection controlled by run-on timer
Bedroom (if separate)	3 off double GPOs
Study (if separate)	1 off double GPO
Living Room	5 double GPOs
NBN and DB cupboard	2 double GPOs
Balcony	1 off double GPO (weatherproof)
Air-Conditioning	Dedicated circuit to VRV indoor and outdoor units

3.11.12.Lightning Protection

Lightning protection will be provided in accordance with AS1768.

Steel reinforcement within structural columns will be used as down conductors which are connected to separate earth electrodes within each corner of lowest basement level. Test points are to be provided at lowest basement level and roof level.

3.11.13.Surge Protection

Surge protection will be provided on MSB.

3.12. LIGHTING

No lighting will be provided to retail and/or commercial tenancies on ground floor (TBC).

3.12.1.Carparks

Lighting in the carparks shall comply with the requirements of AS1680 and shall utilise weatherproof fluorescent or LED fixtures giving a minimum average lighting level of 80 lux throughout. LED high bays will be provided to supplement the fluorescent fittings in the carpark entrance to satisfy transition lighting requirements.

3.12.2.House Areas

Lighting in house areas will be in keeping with the interior design concept. Fittings will be chosen with a view to low energy cost and minimal maintenance. Sources shall generally be LED throughout.

Amenities areas will be lit using recessed LED downlights.

Back of house rooms and corridors will generally be lit using surface mounted or suspended weatherproof fluorescent or LED battens.

3.12.3.Exterior Lighting

Weatherproof exterior lighting shall be provided in keeping with the landscape and building architectural design concept. Sources shall generally be LED and/or fluorescent throughout.

3.12.4.Commercial Office Levels

Lighting will be chosen in conjunction with the architect and will comprise a low glare LED T-bar troffer capable of air boot installation. Low glare LED recessed downlights will be provided if required also. Lighting to be designed to be under 2.5W/m2/100 lux.

Client to confirm if base building office lights are to be installed as part of base building works.

Amenities areas within office levels will be lit using recessed LED downlights.

3.12.5.Apartments

Lighting will be chosen in conjunction with the interior designer and installed as the per architect's detailed dimensioned drawings. Refer to areas served below:

Kitchens	Under cupboard linear LED strip lights Recessed LED downlights elsewhere
Bathrooms	IP rated recessed LED downlights Under cupboard linear LED strip lights (over vanity area)
Laundry	IP rated recessed LED downlights
Bedrooms (if separate)	LED recessed downlights
Living Areas/Corridors/Study	LED recessed downlights
Balcony	IP rated exterior LED wall light. Downlights not permitted due to safety considerations

3.12.6.Lighting Controls

Lighting control for house and external areas (to comply with the requirements of Section J of the BCA) is to be provided by a combination of daylight switches (photoelectric (PE) cells), occupancy sensors and electronic time switches. Contactors controlled by these devices will be used to switch higher current circuits.

No intelligent lighting controls will be provided. No BMS interface is provided to lights. Control methodology as follows:

- Occupancy sensors shall be provided within the basement carparking areas to control lights at all times (including lift lobbies). Some carpark entry transition lights will be controlled by PE cell as they won't be required at night.
- Stair lighting will be controlled via occupancy sensors located at each landing within the fire stairs.
- Amenities area lighting will be controlled via occupancy sensors.
- Back of house rooms will be manually switched.
- External lights will be PE cell controlled.
- Office lights shall be switched in maximum 150m2 zones via motion sensors. Perimeter lights shall be switched using dual technology (PE/motion) sensors. No light switch panels will be provided on office floors as part of the base building works.
- Ground floor lobby lights shall be time clock controlled during business hours with manual override via local light switch panel after hours.
- Apartment lighting shall be controlled via manual local switching with no dimming or two way switching.

In all areas (except fire stairs and external), some lights will be left on as 24/7 unswitched 'security' lights. DBs supplying lights will be provided with auto/on/off switches to control lights in the event of maintenance or fault.

Switch Plates

Flush mounted stainless steel architectural series switch plates shall be installed throughout the front of house areas (as applicable). White Clipsal 2000 series switches shall be provided throughout all

back of house areas. Light switches within apartments will be equivalent to Clipsal Saturn Series (TBC).

Weatherproof switches (Clipsal 56 series IP65) will be provided as dictated by the application.

3.13. EXIT AND EMERGENCY LIGHTING

Exit and emergency lighting will be provided in accordance with AS2293 and the BCA. Exit and emergency lights will be single point computer monitored. System shall be able to monitor and test all emergency lights wirelessly. LED lamp sources shall be used throughout.

Client to confirm if they want computer monitored as this locks them in to a single light fitting supplier for the house lighting.

Front of house exit signs shall be blade type.

System head-end shall be located in building manager's PC.

No lighting will be provided to retail and/or commercial tenancies on ground floor.

3.14. COMMUNICATIONS (COMMS) SERVICES

3.14.1. Authority Application

An application with NBN Co needs to be carried out in due course.

3.14.2. MDF Room

A main distribution frame (MDF) room shall be provided in the basement. Two diverse lead-in pathways will be provided to the MDF room (TBC).

To enable the tower to have flexible access to voice and data comms, provision will be made for a total of three service providers (TBC). This provision will at this stage consist of space within the MDF room for additional frames and termination equipment.

The MDF room will be 2-hour fire rated and will require double door access.

3.14.3. General Reticulation

Comms cables shall be reticulated on cable trays / baskets within dedicated fire rated risers and comms cupboards. The tower will be provided with 2 separate comms risers – one for house and one for tenant. All base building comms cabling (including TV, security, mobile coverage) will be reticulated in the house comms riser.

3.14.4. Voice and Data Comms

Base building provisions for each floor will comprise 8 pair Cat 6 terminated onto a frame reticulated in house comms riser and cabled from MDF room. Data outlets (Cat 6) will be provided to house services as warranted by the application. The tenant comms riser will be provided with cable tray/basket only (TBC).

Apartment outlets will be reticulated directly from the NBN equipment located within each apartment. Cat 6 outlets will be provided in accordance with the following schedule and as located on the architect's detailed dimensioned drawings:

Kitchen	1 outlet
Living Area	4 outlets

Bedroom	2 outlets
Study	1 outlet

The provision of the handsets, active equipment and peripherals, together with line connection fees, will be the responsibility of the developer.

All telephone outlet face plates are to match the general purpose outlets.

No comms will be provided to retail and/or commercial tenancies on ground floor.

Earthing to comms equipment will be per the requirements of AS/CA S009 and AS3000. Surge protection will be provided on copper lead-in equipment as applicable.

3.14.5.Master Antenna Television (MATV) / Pay TV System

The development will be provided with a free to air and pay TV network installed to the requirements of the Foxtel Installation Procedures Manual. The latest version at time of tender is to be used. All the equipment to be used shall be on the Foxtel approved list. The backbone and head-end equipment will be located in the house comms riser.

Outlets will be provided in accordance with the retail/commercial tenancy fitout requirements. All retail/commercial tenancies shall be responsible for reticulating cabling to their outlets from the backbone in the comms riser (as applicable).

Apartment outlets will be provided in accordance with the following schedule and as located on the architect's detailed dimensioned drawings:

Living Area	3 outlets
Bedroom	1 outlet

All TV outlet face plates are to match the general purpose outlets.

3.14.6.In-building mobile coverage (TBC with client)

An in-building mobile coverage system will be provided to PCA Grade A requirements. This will comprise a distributed antenna system. Coverage will be provided to 100% GFA and lifts.

3.14.7.Public Address (PA) System

A PA system will not be provided.

3.15. PLANT ALARMS

Refer below schedule for minimum equipment monitored by the building management system (BMS). Requirements TBC pending detailed design.

Main Switchboard Points

Description	Point Type	Signal
Mains Available	Digital Input	Voltage Free
Surge Protection Device (General Alarm/Fault)	Digital Input	Voltage Free
Power factor correction unit (General Alarm/Fault)	Digital Input	Voltage Free

Each MCCB (open, closed, tripped)	Digital Input for each state	Voltage Free
Each ACB (open, closed, tripped, racked out)	Digital Input for each state	Voltage Free

General

Point Description	**Point Type**	**Signal**
Access Control System (General Fault/Alarm)	Digital Input	Voltage Free
CCTV System (General Fault/Alarm)	Digital Input	Voltage Free
Rack mounted security system UPS (General Fault/Alarm) – provide per UPS	Digital Input	Voltage Free
Emergency Lighting Monitoring System (General Fault/Alarm)	Digital Input	Voltage Free
Each digital power meter: Measure the following in real time: L-N Voltage Phase A, L-N Voltage Phase B, L-N Voltage Phase C, L-L Voltage A-B, L-L Voltage B-C, L-L Voltage A-C, Average L-L Voltage, Phase A Current, Phase B Current, Phase C Current, Neutral Current, Line frequency, Average Power Factor (3 phase with sign), kWh 3 phase power – active, reactive and apparent Total harmonic distortion	High Level Interface	RS485 interface

3.16. SECURITY

No security provisions will be allowed for retail and/or commercial tenancies on ground floor.

3.16.1.Head-End Equipment

A dedicated security room will be provided in the basement. This room will be sized to cater for up to 3 security equipment racks. The current spatial allowance for this room does not cater for a 24/7 manned security office.

3.16.2.Access Control

The access control system shall be a rack mounted IP based system, configurable on site or via the internet.

3.16.3.Access Controlled Doors

All tenant and visitor's general entry and exit doors shall be access controlled.

Long range proximity card readers shall be installed for vehicle entry and exit paths.

Where a proximity card reader is installed to control access through a door the following configuration shall be provided as a minimum:

- Proximity card reader
- Electronic locking device
- Tongue sensor input or bond sensor input for electro-magnetic locks
- Door reed switch contacts for door status monitoring and alarm
- Egress passive infrared (PIR) detector and push-button (for doors with no exit handles)

3.16.4.Intruder Detection System

All building perimeter doors will be monitored by the access control system using door reed switch contacts. This includes all fire stair doors.

A duress alarm will be provided at the ground floor lobby reception desk.

Back to base monitoring will be provided for all alarms.

3.16.5.FIP Interface

Any access controlled door with electronic locking devices situated in an emergency exit path shall have an override control circuit via the FIP.

3.16.6.Lift Access Control

All lifts shall be installed with a proximity card reader. A card reader will be used to call the lift (located on lift shaft wall) and a card reader inside the lift will be used to operate the lift.

3.16.7.Fire Stair Re-entry

Fire stair re-entry via a push button intercom to the ground floor reception desk shall be provided every four (4) levels. An electronic locking device shall be required on every fire door. These locking devices shall be fail safe devices and allow the fire doors to be opened on a fire alarm signal.

3.16.8.CCTV Head-End Equipment

The CCTV system shall be a rack mounted IP based system, configurable on site and/or via internet. Back to base monitoring shall be provided for all cameras.

Camera enclosures will be selected to suit architectural finishes and environmental conditions.

A high level interface will be provided between the access control and CCTV systems.

The CCTV head-end equipment shall include the following as a minimum:

- Minimum of 20 camera inputs;
- Minimum frame per camera 25 frames/second full image with video or above quality;
- Resolution a minimum of 5MP;
- HDMI and VGA output up to 5MP resolution;
- Compression ratio of 5:1;
- Memory to provide a minimum of 30 days storage;
- Provision of 2 monitor outputs including 1 off split screen and 1 off spot monitor;

- Provision of 1 LED monitor for the interface to the recorder;
- RS485 high level interface;
- 1 or more audio inputs which can be synchronized to the images;
- RJ45 10/100baseT Ethernet network card with LAN/WAN base access with IP addressable facilities;
- USB ports for mouse/keyboard;
- Analogue video output for connection to VTR;
- Internal or external CD-RW/DVD-RW;
- Ability to be accessed by external networks through a series of passwords;

3.16.9.Cameras

All cameras will meet the following specified below as a minimum:

- IP based fixed colour (no PTZ cameras envisaged TBC with client)
- 3MP full HD
- Real time video
- Up to 50m IR visibility
- True day/night
- No greater than 2.5 lux sensitivity
- Automatic iris
- Back light compensated where required
- PIR sensor to increase recording rate when the camera is activated in critical areas

Coverage will be provided to the following areas:

- Carpark entry/exit including driveways
- Loading dock
- Ground floor reception
- Visitor entry and exit points and main public areas from the street
- All lift lobbies including goods lift
- Inside lifts
- External building perimeter

3.16.10.Monitors

Monitors shall be provided at the ground floor lobby desk for coverage of all cameras on a scrolling arrangement.

3.16.11.Intercom

An audio-visual intercom system will be provided to allow identification of visitors and allow visitors to enter the building. Intercom locations as follows:

- Ground floor entry doors
- Loading bay
- Underground car park roller door/access door – both entry and exit
- Fire stairs at every 4th floor
- Each apartment

The intercom handset within shall have the ability to contact security (ground floor reception) by pressing a button on the intercom handset.

A set of voltage free changeover relay contacts, one per lift per floor, shall be provided in an appropriate equipment enclosure outside the lift motor room to allow the intercom system to interface with the lift access control system. Requirements TBC.

4. INFRASTRUCTURE SERVICES

4.1. SYDNEY WATER SEWER MAIN

It is proposed to make connection to a sewer junction located on the western side of the site. The site connection to the sewer will be to an existing 300 SGW sewer main due to be relocated to suit the building development

4.2. SYDNEY WATER - WATER MAIN

It is proposed to make the water and fire connections to the existing 150mm CICL located in Elizabeth St

4.3. JEMENA GAS MAIN

A new connection will be required to service the entire site and it is proposed that this connection shall be located adjacent to the water and fire services connection to the site. This will be subject to the gas main being upgraded and extended to suit the new load of the proposed site

A five (5) kPa regulator will be positioned out the front of the site (to be confirmed via discussion with the utility operator).

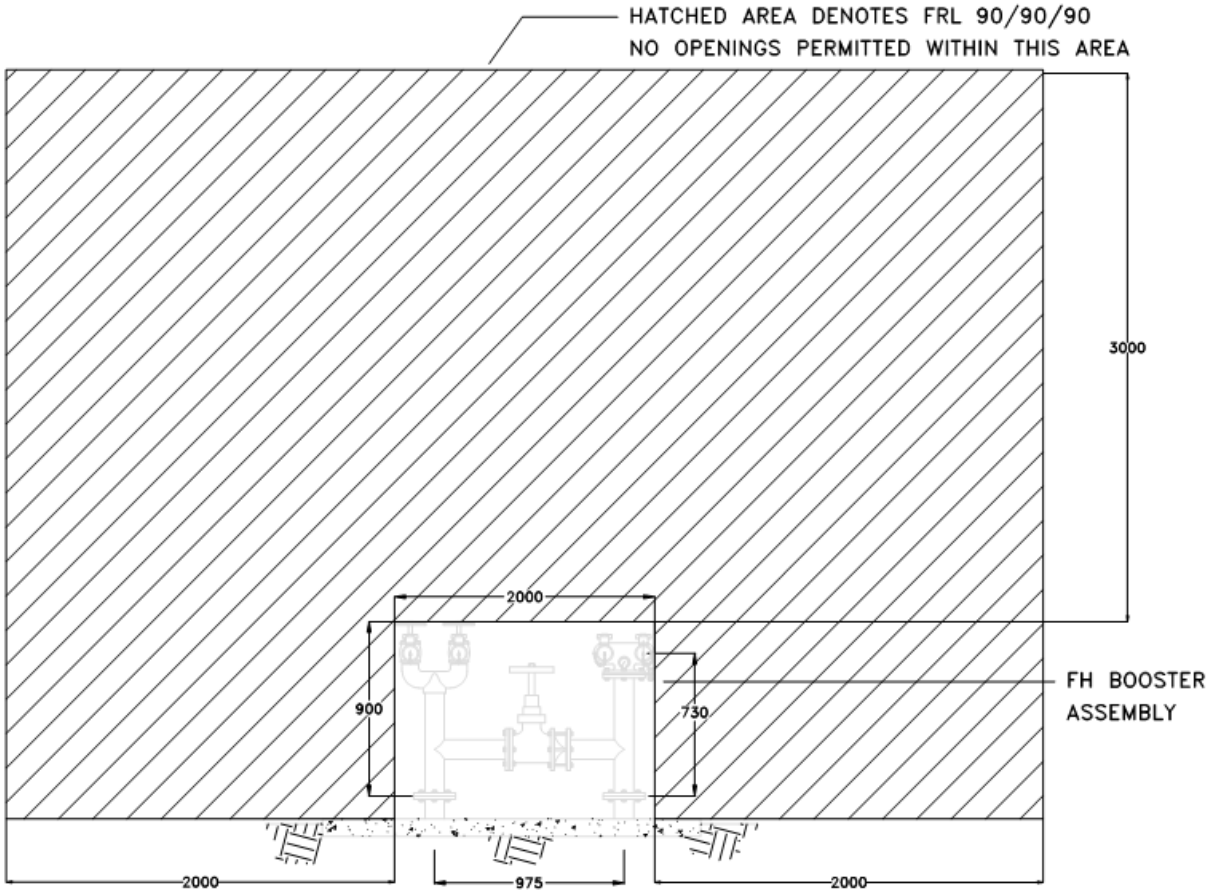
4.4. SUBSTATION

Provision pending application for connection with EE.

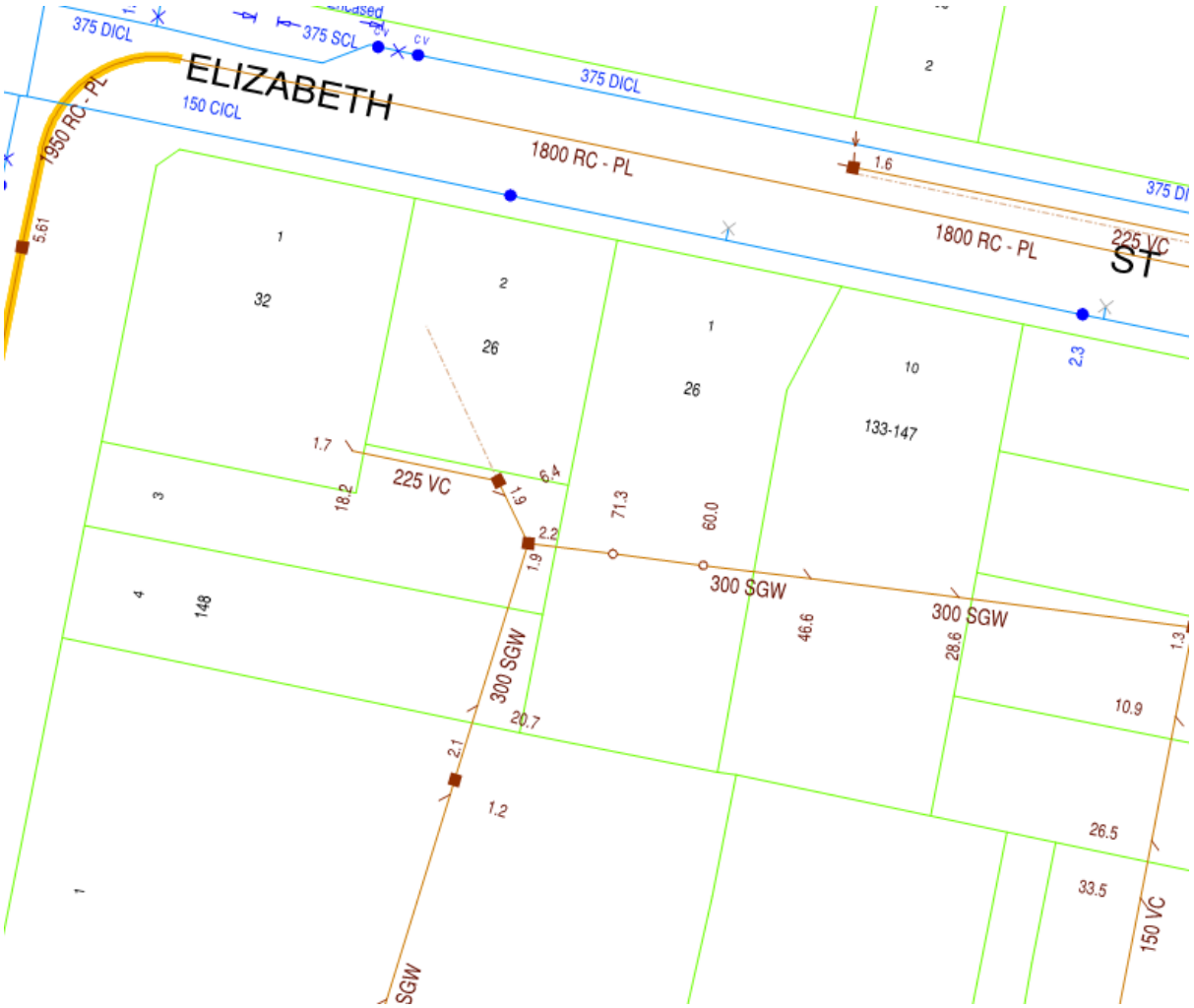
4.5. NBN CO

Provision pending application for connection with NBN Co.

APPENDIX A - Fire Hydrant Booster Requirements



APPENDIX B - Sydney Water diagram



APPENDIX C - JEMENA DIAGRAM