efficient LIVING

ESD & NABERS - Concept Advice

New South Head Road, Edgecliff NSW 2027

Attention: Mr. Dennis Meyer

Issue	File Ref	Description	Author	Checked	Date
D	21-1855	ESD & NABERS – Concept Advice	NM	RP	13/08/2021

Sustainable Building Consultants
p. 02 9970 6181 **e.** admin@efficientliving.com.au
www.efficientliving.com.au

Table of Contents

1. Introduction

Efficient Living has been engaged to complete a concept Environmentally Sustainable Design (ESD) report for the proposed mixed-use development at New South Head Road, Edgecliff, NSW 2027. This concept ESD will outline the sustainability initiatives recommended for the development. The report is a response to the Woollahra Municipal Council's pre-application consultation response as well as the Development Control Plan (DCP) and State Requirements outlined in Section 2 of this report.

2. Site Requirements

2.1 Pre-application Consultation Response

The pre-application consultation response from Woollahra Municipal Council is as follows A development of this scale should be 'best practise'. A 'best practice' site would have a NABERS rating of 6 stars for Energy and 6 stars for water. Meeting minimum BASIX standards for the residential portion of the site would not be considered 'best practice'

In addition to best practice water and energy fittings, the site should include:

- Solar panels
- Use of low carbon construction materials
- Maximum natural ventilation
- Water recycling / stormwater harvesting
- Stormwater treatment including raingardens
- Local native plant species
- Electric vehicle charging infrastructure in both residential and commercial carparks.

As well as the above the development is required to demonstrate objectives and controls outlined within the following Sections contained within Woollahra Development Control Plan (DCP) 2015:

- Chapter E6: Sustainability.

The proposed development will also comply with:

- NCC 2019 Section J Amendment 1;
- NatHERS;
- BASIX.

2.2 Residential

The development is required to comply with BASIX water, thermal and energy targets and achieve target NatHERS star ratings throughout. BASIX energy targets are worth considering in the concept stage;

Energy Targets for residential spaces required to comply with BASIX

Energy Target Zones		
Building Type	BASIX Energy Target	NatHERS Star Rating
High-Rise (6 storey units or higher)	25	5 Star

Additionally, Sepp 65 – 'Good Apartment Design Guide' will apply. Cross Ventilation and Solar Access requirements should be worked through as early as possible to avoid changes in layouts during design development.

2.3 Commercial

The following table outlines the ESD controls within the applicable DCP, also highlighting sections within the report demonstrating compliance with the environmental controls outlined below. The purpose of controls within the DCP is to ensure all objectives are satisfied, therefore only a response to the controls has been provided.

Commercial and non-residential buildings

	Objectives	Controls	Project response
01	To promote sustainable buildings, design and construction.	C1 Office development with a gross floor area of at least 1,000m² achieves a minimum 4 star NABERS rating. Notes: i) C1 above applies to new development and work involving significant alterations and additions to existing development. ii) For the purpose of the above control, the calculation of gross floor area does not include parking, loading or vehicular access, to these areas. iii) To demonstrate that this rating will be achieved, the applicant is to submit with the DA: a) an ESD Statement prepared by an accredited professional providing design evidence that a NABERs 4 star rating can be achieved; or b) evidence of a Commitment Agreement. A Commitment Agreement is a contract between the NABERS National Administrator, the Office of Environment and Heritage NSW (OEH) and the building proponent to design, build and commission the premises to achieve a NABERS Energy star rating of 4 or more.	Section 3
O2	To design buildings to reduce the need for artificial heating and cooling, and artificial lighting during daylight hours.	C2 Building articulation, courtyards and light wells allow daylight into internal areas. C3 Windows for buildings are oriented towards the north for maximum solar access. C4 Building elements such as eaves, awnings, operable louvres, projecting sun shades, screens, blinds and balconies maximise solar access in winter and sun shading in summer.	Section 4.1, 4.2, 4.3, 4.6, 4.7, 4.10
O3	To ensure that window placement maximises opportunities for cross ventilation.	C5 Subject to privacy impacts to adjoining properties, buildings contain external windows to provide direct light and natural ventilation. C6 Subject to privacy impacts to adjoining properties, window openings are located in opposite walls and in line with each other to provide for natural cross ventilation. C7 Buildings are designed to facilitate convective currents. This may be by: a) locating small windows on the windward side and larger windows on the leeward side; and b) designing buildings to draw cool air in at lower levels and allowing warm air to escape at higher levels.	Section 4.1

04	To ensure that the use of glazing maximises solar penetration during winter months.	C8 Main windows facing between 110˚ east and 110˚ west of north are designed to be energy efficient (i.e. low emissivity or double glazed). C9 Development provides appropriate sun protection during summer for glazed areas. Extensive areas of glazing are protected from sun during summer using shading devices. Unprotected tinted windows are not an acceptable solution.	Section 4.1, 4.2
O5	To reduce water consumption and encourage on-site water retention and re-use.	C10 For landscaped garden areas in commercial developments, building design incorporates the following measures to minimise mains water demand and consumption: a) rainwater tanks to supply water for plant watering, toilet flushing, outdoor cleaning and cooling systems for the building; b) where suitable, roof gardens to reduce stormwater run-off and provide insulation; c) an irrigation system to minimise waste water; and d) water retention within gardens to direct run-off from impervious uses and water tanks to deep soil areas. C11 Desalination plants are avoided. Desalination plants are not an appropriate water management option because they are an energy intensive and inefficient method for providing fresh water.	Section 5.1, 5.2, 5.3, 5.4
O6	To encourage tree selection that reduces the need for artificial heating and cooling of buildings.	C12 Subject to view impacts to adjoining properties, wide canopied deciduous trees are planted to the north of buildings to provide shade during warmer months and allow sunlight penetration during cooler months. C13 Subject to view impacts to adjoining properties, evergreen trees are planted to the west and east of buildings to prevent glare and heat during warmer months.	Section 4.1

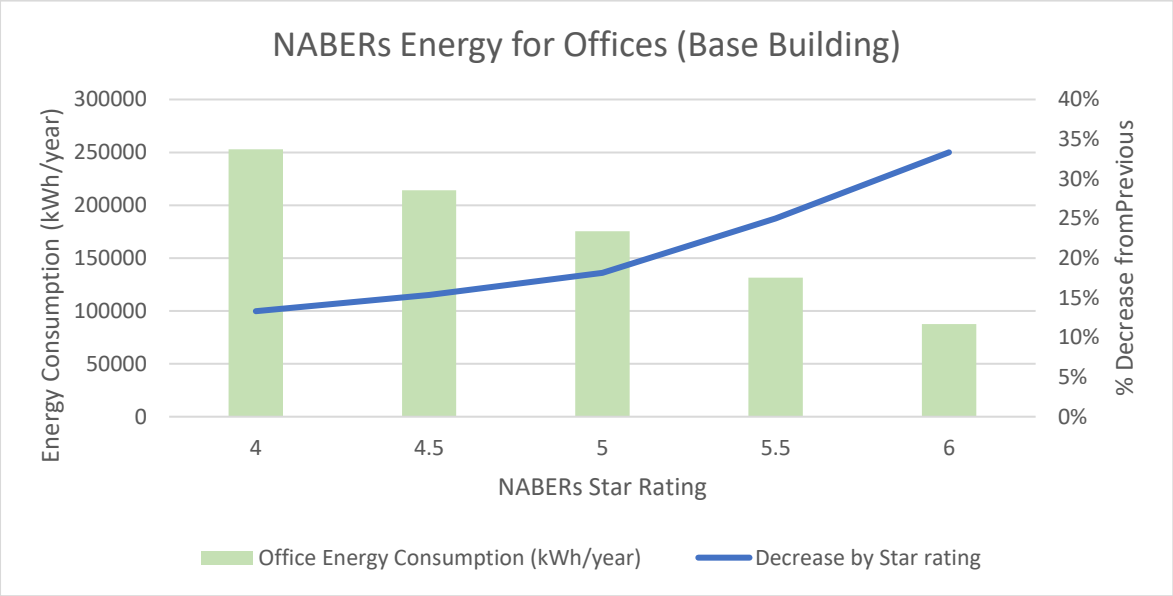
Solar energy systems (including solar panels, solar hot water systems and solar heating systems)

	Objectives	Controls	Project Response
01	To minimise the amenity impacts of solar energy systems particularly in regard to streetscape impacts, scenic quality, visual impact and view loss.	C1 The solar energy system meets the following location requirements: a) is in line with the roof surface or no more than 300mm above and parallel with the roof surface; b) is located behind the front setback and not visible from the street; c) does not involve mirrors or lenses to reflect or concentrate sunlight; and d) for buildings in heritage conservation areas and buildings which are heritage items— is not located on any part of a roof plane, wall or chimney of the principal building form. C2 The location of the solar energy system does not have an unreasonable visual impact on: a) the streetscape and scenic quality of the area; b) visual quality of the area when viewed from the harbour or a public recreation area; c) amenity of adjoining and adjacent properties; or d) existing harbour and city views obtained from private properties.	Section 4.7

3 Rating Tools

Woollahra Councils conditions have suggested a 6-star NABERS Energy Rating which is no easy feat. Previously only two 6-star commitment agreements were lodged for offices in Australia, with neither reaching this target. There are also currently only thirteen 6-star offices in NSW when green power is not factored in, a number of these are older buildings with less amenities than the proposed development at New South Head Road. The below graph shows that a 6 Star NABERS Base Building Energy Rating requires a 34% energy reduction from a 5.5 Star NABERS rating.

Graph 1: NABERS Base Building Energy Targets by Star Rating



**The above graph assumes 100% electricity*
***The above graph assumes commercial NLA of 2118m²*
****The above graph assumes hours of occupation above 20% = 50hrs*

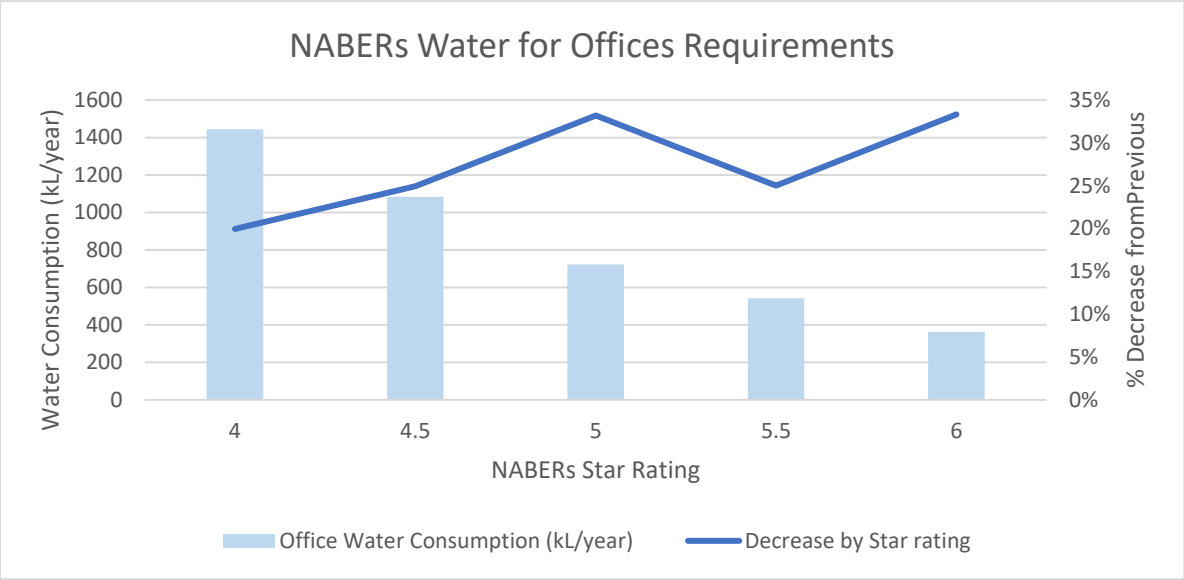
Seven Offices in NSW are currently targeting a 5.5-star Energy Base Building NABERS Rating commitment agreement and only one commitment agreement for Apartment buildings is currently being undertaken with a target Energy rating of 4-star. It is proposed that a 5.5-star NABERS Energy Target be set for Office space and a 4.5-star NABERS Energy Target for Apartment buildings which would be in line with best practise in Australia. This will require the need to consider energy efficiency throughout all aspects of design. The proposed building at New South Head Road will need to optimise the façade, consider efficient equipment selection throughout all services, implement smart controls as well as incorporate renewable energy technologies.

An average NatHERS star rating of 7-star is recommended to be targeted in this development, two stars above minimum requirements. It is recommended that an average star rating is taken rather than a minimum to ensure consistency in glazing and insulation requirements throughout the residential portion of the development. As the roof does not provide suitable space for Solar PV to accommodate both residential and commercial and therefore a maximum target BASIX Energy score of 30 is recommended to be set. BASIX Water score target is recommended to be set to 40, as it would be challenging to get higher than this given the site constraints. Consideration also must be given to fixtures flow rates to ensure hot water reaches outlet in reasonable time.

A 6-star NABERS water rating has also been proposed by Woollahra Municipal Council for the commercial space in this development. This will be a difficult target to reach due to site constraints. BASIX will likely require some rainwater harvesting for irrigation of balcony planting and rooftop

gardens, this will take away rainwater harvesting area for commercial spaces. EOT facilities which encourage building inhabitants to use active transport to get to work also makes this target more difficult to reach. With no clear indication from NABERs on how to estimate water consumption it is advised that the Greenstar Potable water calculator is used and in this case it is recommended to set the NABERs Water rating target at 4.0 stars.

Graph 2: NABERS Base Building Water Targets by Star Rating



**The above graph assumes commercial NLA of 2118m2*
***The above graph assumes hours of occupation above 20% = 50hrs*

4 Energy

4.1 Façade

The façade performance requirements will be determined upon completion of the NatHERs and Section J JV3 assessments. The proposed development consists of a heavily glazed façade, providing suitable shading will assist in lowering peak afternoon solar gains.

4.1.1 Residential Façade Energy Performance

Provisions included in proposal:

- Naturally ventilated common areas where possible will assist in improving the BASIX and NABERs scores;
- Balconies and terraces sized to allow external clothes drying racks;
- Maximising window operability through sliding doors and awnings with non-restricted openings to balconies. Operability of windows is paramount in reducing the cooling loads in heavily glazed high-rise apartment developments;
- The wrap around balconies provide shade at times when sun is highest in the sky;
- Vertical shading devices minimising direct solar loads to be considered to East and West orientations during hours of rising and setting sun;
- Blinds to eliminate solar loads and glare during late afternoon hours.
- Simulation exercises to be carried out in order to optimise façade performance, without compromising daylight amenity;

- Windows and insulation will be chosen in line with NatHERS and NABERS to maximise performance based on thermal comfort modelling. Including thermal breaks and with Solar Heat Gain Coefficient's (SHGC) optimised to minimise solar heat gains without compromising daylight amenity for internal occupants;
- Planter boxes and vegetation will be positioned where suitable to reduce cooling loads while not having an adverse impact on views from apartments.

4.1.2 Commercial Façade Energy Performance

Provisions included in proposal:

- Windows and insulation will be chosen in line with NABERS and Section J modelling to maximise performance based on thermal comfort modelling. Including thermal breaks and with Solar Heat Gain Coefficient's (SHGC) optimised to minimise solar heat gains with high visual light transmittance to not compromise on daylight amenity for internal occupants;
- Minimise Air leakage in line with Greenstar air leakage rate <5m^3/hm^2 at 50 Pa;
- Vertical shading provided on podium levels consideration to be given to automated shading devices;
- Mixed mode ventilation or demand control ventilation to be considered to allow natural ventilation when outside conditions are suitable. Temperature, noise and air quality sensors can allow windows to automatically open when external ambient conditions are suitable to use natural ventilation rather than HVAC. Testing will be required to choose the most suitable option.

4.2 Passive Design Principles

The development will consist of passive design strategies that respond to a range of environmental conditions the building is exposed to. These elements of passive design result in improved internal environmental quality, whilst minimising the impacts on the building and its services associated with increased occurrence of extreme temperatures due to climatic warming. Aspects of passive design principles in the design include:

- Vertical Shading devices to the North, East and Western facades, reducing solar gains whilst allowing daylight to penetrate deep into the floor plate. Dense placement of vertical shading structures which mitigate solar loads, as well as reduce afternoon glare during early morning (Eastern orientation), or later hours of the afternoon (Western orientation);
- Cross ventilation to meet and surpass ADG minimum requirements;
- Heavy thermal mass, reducing building peak loads and annual energy consumption;
- Wrap around balcony to provide shading from solar radiation during summer;
- Use of green roofs, reducing solar loads on conditioned spaces, whilst improving local air quality and providing a space for the community to enjoy, encouraging occupants to spend more time outdoors, decreasing reliance on heating and cooling;

4.3 Air Conditioning

Air conditioning systems represent one of the highest single energy users for a mixed use development. Items for consideration include:

- Apartments to operate with a VRF or highly efficient split system. Star ratings should be a minimum of 5 Star new rating;
- Highly Efficient VRF Systems for Commercial and Retail Areas - SEER > 5;

- Refrigerants with reduced global warming potential;
- Air conditioning systems which are interlocked to balcony doors and switch off when doors are open;
- Plant location has been considered to aid energy efficient operation of equipment;
- BMS which raises alarms when anomalies are identified by the system;
- Optimised HVAC zoning that considers façade orientation and internal loads.
- HVAC system controls to disable system when rooms are unoccupied in commercial spaces;
- Mixed mode ventilation/Demand control ventilation with CO_2 and humidity sensors to be considered and connected to HVAC system as per previous section.

4.4 Car Park Ventilation

To reduce the energy consumption associated with car park ventilation, car park exhaust fans should operate from VSD drives, combined with CO sensors.

4.5 Domestic Hot Water

The following recommendations to reduce greenhouse gas emissions associated with domestic hot water should be carefully considered in design:

- Heat pumps with a COP above 3.5 under design conditions;
- End of Trip showers to be >3 Star WELS rated;
- Bathroom taps to be minimum 5 Star WELS rated;
- Consideration to be given to run length to ensure hot water does not take too long to reach outlet when low flow fittings are installed.

4.6 Lighting

Lighting can use over 20% of a buildings electricity consumption, therefore efficient luminaires and lighting control systems are critical in order to optimise a buildings energy efficiency.

Provisions included in proposal for Development Application:

- Lighting loads that meet or surpass NCC2019 requirements;
- High efficiency LED's throughout;
- Zoned car park lighting with occupancy sensors;
- Infrequently occupied spaces such as basement spaces, fire stairs and WC's should operate with an occupancy sensor;
- Automated lighting control systems such as occupant detection and daylight adjustment should be provided to all commercial office floors. Maximum control area of 100m^2;
- Light shelves and light internal colour schemes to increase daylight penetration, decreasing the use of artificial lighting;
- Daylight factor >2% for office for minimum 40% floor area;
- External lighting should be kept at a minimum and operated through daylight sensors.

4.7 Renewables

To reduce energy consumption associated with common area or commercial electricity, Solar PV panels will be introduced to suitable, available roof space. A shadow analysis will be carried out to determine areas most suitable for a PV array, the PV system will be sized accordingly and assigned to commercial or residential areas based on future testing.

4.8 Vertical Transport

Provisions to be included:

- Class A energy efficiency to VDI-4707 or ISO standard;
- Shutdown when building is unoccupied;
- Regenerative braking;
- VVVF drives.

4.9 Metering and Monitoring

Building management system is to be installed to be open protocol, to have mix mode ventilation strategy, morning warm-up/cooling down and afternoon shut time optimization.

Comprehensive commissioning, tuning and maintenance activities must take place in order to optimise building performance and maintain efficient operation throughout the life of the building.

Sub-metering strategies will be put in place in line with NABERs rules to ensure major commercial energy end uses and individual commercial and residential tenancies are separately metered, providing greater visibility on energy consumption trends over time. This allows anomalies in consumption to be identified, investigated and resolved resulting in improved energy performance. Sub-metering can also be used to raise alarms should:

- Excessive consumption be identified in central plant;
- Meter readings of child to parent meters be inconsistent, highlighting the need to calibrate/service meters.

4.10 Additional Measures

Provisions to be considered:

- Efficient equipment and white goods installed throughout, with energy star ratings within 1 star of the highest available;
- Embedded electricity network, which can reduce cost of electricity for tenants, provide Solar PV and electric car charging spaces as a sign-up inclusion, saving developer money and minimising strata bills for tenants;
- Purchasers will have the opportunity to select ceiling fans in the apartments. Ceiling fans are forecast to come back into trend in homes and make an entrance to the apartment market. Largely supported by the increase in apartment ceiling heights and changes expected to the BASIX technical notes. This will promote natural ventilation in all units but especially the unit's without dual aspects and significantly reduce reliance on mechanical cooling.

5 Water

These water saving initiatives reduce the pressure on the Woollahra Municipal Council's infrastructure and protect the development from future water shortages resulting from climate change.

Provisions included in proposal:

- Rainwater to be collected for irrigation and testing to be carried out to see if it is valuable to connect to a portion of toilets. Rainwater tank sizes will be determined during design development based on predicted water collection. Collection area is too small to provide rainwater for all toilets in development;
- Fire system test water is to berecycled;
- Highly efficient water fixtures will be used. It is important to take into account pipe run lengths to ensure hot water does not take too long to reach fittings when low flow fittings are installed.

5.1 Fixtures and Fittings

The development will reduce water consumption by installing fixtures and fittings in line with Green Star Design & As Built best practice requirements:

Fixture Type	Recommended Minimum WELS Rating
Taps	5
Urinals	6 (waterless)
Toilet	4
Shower	3
Dishwasher	4

5.2 Landscape & Irrigation

A variety of outdoor areas will be provided for use of occupants, therefore WSUD initiatives will be embedded in to design that reduce the strain on natural resources which is often seen when providing liveable outdoor spaces.

Water reducing irrigation measure implemented include:

- Water Sensitive Urban Design (WSUD) principles incorporated into the landscape design;
- Irrigation systems will comprise of subsurface drip systems and automatic timers with rainwater/soil moisture sensor controls;
- Where possible, stormwater runoff will be directed to the garden beds;
- Irrigation will be provided to all soft landscape areas and will be specified within later design packages;
- Native species will be incorporated throughout the development.

5.3 Storm Water Management

An on-site detention (OSD) tank strategy will be developed in accordance with local council requirements. The OSD tanks will incorporate flow control measures to ensure peak flows generated under proposed conditions do not exceed flows generated under pre-developed conditions, in accordance with regulatory requirements. The following features of the stormwater design assist in reducing the quantity, whilst improving the quality of site stormwater:

- Overflows from hardscaped areas will be filtered and temporarily detained in OSD systems before slowly releasing back to community storm water systems;

- Vegetated podium areas and open terraces will reduce peak rates of runoff and alleviate the pressure on storm drainage systems by the retention, diffusion and evapotranspiration of rainwater;
- Storm water runoff that is treated using appropriate devices and filtration systems to improve storm water quality.

5.4 HVAC System

Air cooled VRF systems eliminate water consumption associated with space conditioning, thus significantly reducing the buildings water demand.

6 Materials

Initiatives associated with sustainable material procurement include the following items:

- Major material components to come with environmental declaration certificates;
- Steel manufacturers should have a valid ISO 14001 Environmental Management System (EMS) in place and be a member of the World Steel Association's Climate Action Program (WSA CAP);
- Cement should minimise Portland cement in line with Green Star credits;
- Concrete should be made with a reduction in water use;
- Timber should be PEFC or FSC certified;
- Materials with a recycled content where possible;
- Construction waste recycled, reused or disposed of in accordance with the site WMP.

7 Transport

The development is situated within close proximity to Edgecliff bus and train station, therefore having access to local amenities and public transport facilities which reduces reliance on cars.

Provisions included in proposal for Development Application:

- End of Trip Facilities and internal bicycle parking are to be provided;
- Provision of electric car charging car parking spaces, suitable number based on the capacity of the substation;
- Car parking spaces to have ability to retrofit electric car charging in future.

8 Conclusion

Through further investigation and design development, a combination of suitable ESD initiatives outlined in this report will be implemented to the proposed development at New South Head Road. The following targets are recommended to ensure that the project is in line with best practice for mixed-use developments in Australia:

- NABERS Base Building Energy for Offices: 5.5 stars;
- NABERs Energy for Apartment Buildings: 4.5 stars;
- NABERs Water for Offices: 4.0 stars;
- NatHERS Average star rating: 7 stars;
- BASIX Energy Score: 30 points;
- BASIX Water Score: 40 points.