MEDLAND ENGINEERING

SIR MOSES MONTEFIORE JEWISH HOMES PROJECT APPROVAL – MP10_0044 BUILDING D

PROJECT APPROVAL MODIFICATION CONDITION (A5) ENERGY EFFICIENCY TARGET – CARBON EMISSION REDUCTION

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SECTION 1 | EXECUTIVE SUMMARY

The Project Approval for Application, MP10-0044, clause A5, requires that the following energy efficiency target is met.

- Carbon Emissions reduced by 40%.

This report demonstrates strategies that may be applied for Building D to achieve the carbon emission reduction target.

These Carbon Emission Reduction strategies may include:

- Replace dichroic, fluorescent and halogen lamps with long life Light Emitting Diode (LED) technology;
- Next generation lighting controls to reduce the lighting output when artificial light is not required;
- Minimum Five (5) star energy efficient appliances as stipulated in the Federal Government Energy Rating scheme;
- Increased quantity of outside air which will increase periods of free cooling;
- Implementation of renewable energy Photovoltaic (PV) solar system;
- Openable windows linked to control the air-conditioning status;
- Individual room heating and cooling controls for the resident's rooms; and
- Operational measures to ensure the building systems are working efficiently for their lifecycle.

SECTION 2 | EXISTING CARBON EMISSION BENCHMARK

The current facility consists of three Buildings A, B & C. The installation reflects the technology and systems that were available at the time of construction.

The existing facility power and gas bills have been reviewed over the last 12 months (September 2015-September 2016). The total carbon emissions are summarised in Table 1 below.

Table 1 - Existing building - 12 Month Carbon Emissions

ENERGY SOURCE	CARBON EMISSIONS (KG CO_2)
Gas	294
Electricity	6016
Total Carbon Emissions	**6310**

This represents a total of 6310 kg CO_2 per annum for the existing Buildings A, B and C.

SECTION 3 | CARBON EMISSION REDUCTION PROJECT INTIATIVES

3.1 CARBON REDUCTION STRATEGY

The total carbon emissions are intended to be reduced by strategies such as:

- New LED light fittings and next generation lighting controls;
- Minimum Five (5) star energy efficient appliances as stipulated in the Federal Government Energy Rating scheme;
- Implementation of renewable energy Photovoltaic (PV) solar system;
- Increased quantity of outside air and natural ventilation;
- Improved air-conditioning controls;
- Operational measures to ensure the building systems are working efficiently for their lifecycle; and
- Micro energy consumption metering.

These measures are detailed within the following sections.

3.1.1 LED LIGHTING AND LIGHTING CONTROLS

The lighting throughout building D is proposed to have Light Emitting Diode (LED) technology. These lamp sources provide the same compliant lighting levels for the dementia patients. Based on the combination of fluorescent and halogen light fittings in Buildings A, B, C the estimated greenhouse gas emissions savings is in the order of 50% for fluorescent and 75% for halogen. We estimate the lighting percentage saving for the LED technology is 60%.

In addition, a smart lighting control system is being considered that is linked to operating hours, daylight control and the nurse call system. These proposed functional controls integration could reduce the amount of time that lighting is running at full capacity. This will further reduce carbon emissions by 10-20%.

3.1.2 FIVE STAR ENERGY EFFICIENT APPLIANCES

Montefiore homes are committed to selecting energy efficient appliances to minimise the small power energy requirements in the common areas. Fridges/freezers, dishwashers, cooking appliances, other whitegoods, televisions and entertainment systems will all pass through a rigid cost v benefit analysis when selecting the energy rating. It is proposed that the appliances being considered are minimum 5 star. These appliances range from 20-45% more efficient than the currently installed appliances in the existing buildings.

3.1.3 ENERGY METERING

New energy metering is proposed on all subsystems to provide accurate localise load profiles. These load profiles can be assessed by the facilities management teams to locate negative trends or unusual energy usage.

3.1.4 AIR CONDITIONING

There has been considerable advancement in the proposed mechanical solution for Building D. From a greenhouse gas emissions perspective, reductions can be achieved by increased periods of free cooling via increased outside air and providing individual control for heating and cooling for each residents' room.

3.1.4.1 INCREASED OUTSIDE AIR PROVISIONS

Increasing the outside air does not only improve the indoor environment quality but also increases the number of days of free cooling purely from the increased quantity of outside air. It is proposed that there will be in the order of 50-100% above mandatory outside air provisions. This would potentially reduce the mechanical greenhouse gas emissions by up to 10%. In addition, natural ventilation is proposed by providing openable windows in the residents' rooms. Refer to Table 2. for the proposed increase in outside air provisions.

Table 2 – Increased Outside Air Provisions

LOCATION	BUILDING A, B, C FRESH AIR RATES (L/S)	PROPOSED BUILDING D OUTSIDE AIR RATES (L/S)	PERCENTAGE INCREASE (%)
Residents Rooms	20	40	100
Corridors	Nil	2l/s/m2	N/A
Living/Dining	10	15	50
Staff Rooms	10	10	Nil

3.1.5 IMPROVED MECHANICAL CONTROLS

There are two (2) areas of improved temperature and air-conditioning controls:

- When the resident opens the window in the residents' rooms it will automatically turn off the room heating and cooling; and
- Individual temperature control for each resident room. In the existing buildings' multiple residents 'rooms are controlled by one sensor. This often results in some heating and cooling in rooms that do not require it. This increases carbon emissions.

A combination of these improved controls could reduce mechanical carbon emissions by 15-25% per year.

3.1.6 DOMESTIC HOT WATER

A minimum 20% energy saving in hot water generation can be achieved through more efficient appliances and tapware and more efficient gas fired hot water plant.

3.1.7 RENEWABLE ENERGY

Many renewable energy systems have been considered. Due to its superior lifecycle cost advantages, the system most advantageous system is photovoltaic cells utilising solar energy. For Building D, the roof area available for solar power is relatively small (Refer 3.1.7.1). An option exists to retrofit photovoltaic cells on the existing rooftop in Buildings A & B (Refer 3.1.7.2). As Building C may be retrofitted with an extra floor, it was not considered in these calculations but is available for consideration.

Retrofitting solar panels on buildings A & B will only be considered if the 40% reduction in greenhouse gases cannot be achieved through these proposed initiatives as detailed design is progressed.

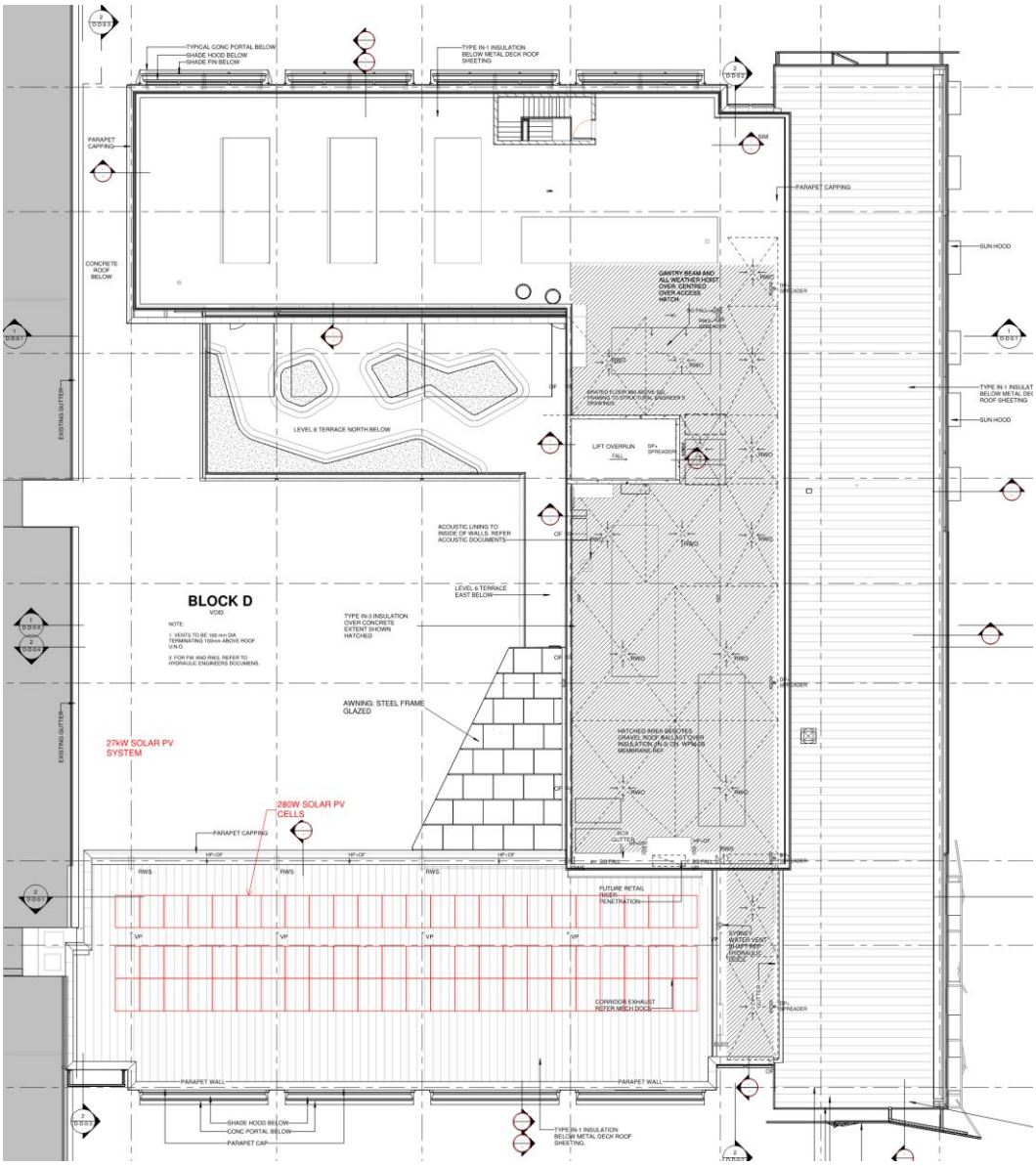
3.1.7.1 BUILDING D – PHOTOVOLTAIC CELLS

The available roof space for Building D is highlighted in Figure 1. This area can produce up to 29.64kW. The 29.64kW system will provide an average daily output of ~118kWh. As the buildings are occupied every day of the year, the total potential greenhouse gas reduction over 12 months is in the order of 38 kg CO_2 per year.

The hardware proposed consists of the following:

114	x	260W Solar Panels 29.64kW;
2	x	SMA 15,000TL Inverter; and
1	x	Commercial Grade Mounting Frame to Suit.

Figure 1. Building D Solar Rooftop Area



3.1.7.2 BUILDINGS A & B

The available roof space for Buildings A & B is highlighted in Figure 2. This rooftop area will be able to fit a 99.84kW system on this building. Solar panels will only be fitted to the existing buildings under the following circumstances:

- 40% carbon reduction targets cannot be achieved in the Building D works only.

This system could include the following hardware:

384	x	260W Solar Panels 99.84kW;
4	x	27kW Grid Feed Inverter; and
1	x	Commercial Grade Mounting Frame to Suit.

The 99.84kW system will provide an average daily output of ~396kWh per day and reduce carbon emissions by 126 kg CO_2 per year.

Figure 2. Building A & B Solar Rooftop Area