



Tropical Energy Solutions

CLEAN > RELIABLE > AFFORDABLE

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The story of the TRIPLE ZERO OFFICE



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In 2014, the team at Tropical Energy Solutions designed the first Triple Zero Power System for a residential application in Townsville. This system demonstrates how well the technology works in a tropical environment, especially when bundled with a property that was designed as an energy efficient building from the ground up (for details see: The story of the Triple Zero Home).

When the business outgrew its previous premises, we decided to move to a larger office and workshop, and demonstrate the suitability of the Triple Zero Power System for commercial applications. A second goal was to show how older buildings could be converted and optimised to become energy efficient, comfortable and compliant with today's workplace requirements.

The building at 21 Echlin Street West End was an ideal candidate for this project. It is a free standing timber building with an iron clad roof with no eaves or awnings, which gave ample opportunities for improvements. Since its construction more than 100 years ago, it had been extended twice and fitted out with amenities including box type air-conditioners.



All renovations had to be carried out on a tight budget to avoid overcapitalising on the old building. Fortunately, no structural work was required but a new front facade was required. It is now equipped with timber and glass louvers. The removal of internal walls and the replacement of sliding windows with additional louvers facilitates the effective use of natural ventilation during the cooler seasons. Four aerodynamically designed ceiling fans (Aeratron) were installed to create additional airflow when needed. By removing the false ceiling in the main building, a very open and airy office of 84m² was created. The 4.5m high roof allows warm air to rise while allowing a layer of cool air-conditioned air at workplace level.



As the tropical climate in Townsville requires the use of refrigerated air-conditioning for approximately 6 months per year, several measures were implemented to minimise both external and internal heat loads. The roof was painted with two layers of high quality reflective roof paint. As expected, it had an immediate and dramatic effect on the indoor temperatures on sunny days. Blinds were installed on all louvered windows to provide control over unwanted solar heat gain during certain times of the day. The installation of a 3m wide awning to the western facade is planned and awaiting construction approval.



Internal heat loads were minimised by the use of energy efficient background lighting and additional task lighting at the six work stations. The heat emissions of the energy efficient ceiling fans are less than 1/3 of that from comparable traditional fans. By installing two small inverter type air-conditioners instead of one large unit, we gained additional control over the temperature, humidity and power consumption inside the office. This ensures that the air-conditioning works hard when switched on. Hard working air-conditioners are able to reduce the air's relative humidity most effectively. In tropical climates, the reduction in humidity is as or more important as the reduction in temperature when creating comfortable work environments. Together, the two 5 star rated air-conditioners consume between 1000 and 1600W under all conditions. Their cool air output of 5000W is sufficient to cool the 84m² of office air to comfortable levels, even on the hottest summer days.

Staff amenities include one fridge, one stove, one kettle and one microwave. The existing hot water system was removed because the town water temperature is sufficiently warm all year round. Based on this optimised electrical load inventory, it was possible to select a comparatively small capacity for the Triple Zero Power System. 24 PV Solar modules (6kW) were connected to a 5kW solar inverter. This unit feeds its power into a 240V micro-grid that is created by a 6kW stand-alone system inverter (SMA Sunny Island). Only 8kWh of battery capacity (Exide Sonnenschein) was needed in this application because in Townsville, the office hours coincide with daytime hours all year round. The batteries act as an additional power source on rainy days and they provide night time power to the server system, security system and fridge. Unlike grid supplied electricity this system does not fail in black-out situations. Additionally, as a Triple Zero Power System is not connected to the grid, no utility approval is required for its installation and no account keeping or meter reading fees apply.



To our knowledge, the Triple Zero Office is the first professional office building that operates with zero electricity bills, zero gas/fuel bills and zero emissions all year round. Anyone interested in more information is invited to visit the Triple Zero Office at 21 Echlin Street, West End QLD 4810 during office hours (Mon-Fri 8:30am – 5:00pm).