OMAN GREEN AWARDS 2011

NOMINATION FORM

Project Details:

Project Title	Temperature Controlled Warehouse Facility
Location of Project	Barka
One Line Description of Project	Multi-user Logistics Facility for Storage & Distribution of goods

Organization Details:

Organization Name	Al Madina Logistic Services Company(SAOC) (AMLS)
CR No.	1023809
Organization Type (Business/NGO/Gov)	Business (Logistics)
Website	www.almadinalogistics.com
Location / Address	P.O. Box 1466, P.C 133, Muscat, Sultanate of Oman (HQ – Muscat Overseas Bldg. Ghala, Mezzanine)

Award Category **THE GREEN FOOTPRINT AWARD**

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1. Effectiveness

1.1 What were your goals?

Design and construct 1st world class Logistics Facility in Sultanate of Oman by including techniques and methods which contributes towards improved LEED/BREEAM rating.

To ensure goals are met in an effective manner AMLS appointed world class renowned Logistics Engineering firm from the United Kingdom to work on the facility design. They are:

a) Project Architect: Ashton Smith Associates
b) Sustainability Consultant: TPE Consulting Engineers

c) MEP, Civil & Structural: TPE Consulting Engineers
d) Refrigeration Consultant: FJB Systems
e) Cost Consultants: Baker Wilkins & Smith
f) Localization Consultant: EIDC

Why TPE Consulting Engineers as our design engineers for a Sustainable Design?

TPE Consulting Engineers brings together the capabilities and specialist skills of three of Ireland's leading practices, JV Tierney, PUNCH Consulting Engineers and Ethos Engineering.

Together they have the extensive resources to provide the full range of engineering services to clients around the world.

With over 100 years of experience in the three companies and a commitment to sustainable design solutions that is founded on years of knowledge acquired on landmark and award winning projects, we provide economical and environmentally responsible complete solutions to our clients within a proactive and co-operative team structure.

1.2 How have you measured your success?

With the incorporation of sustainability design elements as below:

No.s	Sustainability Technique	Application	Advantages
1	Design for ease of Maintenance	Design and specification of building and plant to ensure ease and efficiency of maintenance.	Improves ease of maintenance and extended life of plant Qualifies for LEED / BREEAM credit.
2	Orientation & Passive Solar Design	Orientating the building to maximise passive techniques i.e. avoidance of solar gain to occupied areas	Reduction in solar gains to internal spaces. Saving in cooling system and energy costs. Increases stability of internal environment.
3	High Performance Glazed Facades	Glazed facades affecting heat transfer, solar gain and shading, condensation risk, occupant visual	Improved control of solar heat gains and reduction in cooling

		comfort and acoustic performance. Methods include multiple glazing, solar coatings, inert gas filling, solid or motorised louvres and blinds, ventilated cavity etc.	requirements. Glare reduction. Increase in acoustic performance.
4	Solar Shading	Internal and External shading devices including Brise Soleil, overhangs, blinds, louvres, reflective glass etc.	Reduction in solar gains to internal spaces and glare. Increase heating benefit from low sun in winter. Saving in cooling system and energy costs.
No.s	**Sustainability Technique**	**Application**	**Advantages**
5	Seasonal Commissioning	Operational review/re-commissioning to be undertaken during first year of operation.	Maximises operating efficiency of systems. Qualifies for LEED / BREEAM credit.
6	Occupant and/or Daylight Controlled Switching	Sensors incorporated to switch internal electric lighting in relation to occupants and levels of external daylight.	Maximise use of daylight. Minimise use of electrical lighting. Qualifies for LEED / BREEAM credit.
7	Heat Recovery	Various methods of extracting heat energy from a waste source and using it elsewhere.	Reduces direct heating energy consumption. Contributes towards LEED / BREEAM rating (CO2 output)
8	Water Conservation Management Techniques	Water Leak Detection Sanitary Water Supply Shut-off Non-Touch Water Appliances One-Touch Water Appliances Urinal Flush Controls Flow Restrictors Waterless Urinals	40%-90% savings in cold water usage on unmanaged systems. Saving on mains water and drainage. Minimise wastage of water due to major water leaks. Contribute towards LEED / BREEAM rating.

9	Minimise Air Leakage Coupled with Heat Recovery on Deliberate Ventilation	Reduction of ingress of hot air to temperature controlled areas. Any required ventilation to employ heat recovery – out going air cools incoming air.	Reduces refrigeration load, associated power consumption and CO2 emissions.
10	Energy Efficient Lighting in Admin/Office Areas	Use of electronic ballasts and high frequency T5 lamps in all work area lighting.	Lower running costs.
No.s	**Sustainability Technique**	**Application**	**Advantages**
11	LED Lighting in Warehouse	Use of LED lighting in warehouse in lieu of traditional Metal Halides.	Lower running costs. Lower maintenance costs.
12	Variable Speed Drives	Speed controlled drives on pumps and fans where applicable.	Systems can be accurately commissioned.
13	Energy Monitoring	Provide energy meters for all areas of the building including electricity.	Provides client with sufficient information on energy consumption to allow for the development of an energy strategy for the facility and identify problem areas in energy consumption.
14	Air Heated Ground	Maintains temperature of the ground above freezing (particularly under freezer chambers).	Free heating using ambient air.
15	Solar Collectors	Roof mounted fluid based panels generating heat to fuel domestic hot water for instance.	Free Non-fossil fuel source. Savings on roof cladding in certain instances. Generally simple installation procedures.

16	Photovoltaic Monocrystalline	The most efficient of the PV technologies in good light conditions.	Contributes towards LEED / BREEAM ratings.

No.s	Sustainability Technique	Application	Advantages
17	Building Material Specification	Building Materials specified in accordance with Green Guide to Specification or similar.	Minimises impact on the environment of materials. Minimises embodied energy within buildings. Qualifies for LEED / BREEAM credit.
18	Thermal Mass	Increasing the thermal mass to reduce peak internal temperatures	No operational cost. Reduces peak installed capacity. Allows equipment to operate nearer to optimal conditions.
19	Minimise Construction Site Impacts	Adopt best practice policies to all site activities	Minimise wastage, pollution and energy consumption from site activities. Qualifies for LEED / BREEAM credit.

2. Innovation & Creativity

2.1 How were innovative methods, strategies or ideas applied?

Design for Ease of Maintenance:

Facilities designed without adequate provision or allowance for maintenance result in systems running inefficiently and increased running costs. They also restrict preventative maintenance and general wear and tear maintenance from being carried out. Examples of 'Design for Ease of Maintenance' that are being provided include;

a) Gantry network for access to main service runs and valve stations
b) Gantry platforms around refrigeration coolers

c) Sprinkler zone valves located within the main sprinkler pump house
d) Highest maintenance electrical and refrigeration plant located at ground level of main Plant room

Orientation & Passive Design (Including Solar Shading, Minimizing Air Leakage & Infiltration)

Orientation for the Distribution Centre has being driven by operations efficiency and maximizing the land space available which will yield far greater paybacks than passive solar techniques. Examples of where 'Passive Solar Design' is being provided include;

a) Light colored external facade finish to minimize solar heat absorption
b) Overhang at top floor of Accommodation Block provides a level of solar shading
c) Lobby to entrance area & chilled dock pods to have internal and external doors to help maintain internal temperature

An IES Simulation has been carried out which focuses the Mezzanine Offices and Main Stairwell and the effects of Passive Design Techniques such as;

a) Brise Soleil (Various Sizes and Configurations)
b) Improved Air Tightness (Minimizing Air Infiltration)
c) Refer to next page on IES Simulations conducted

Overview on IES Thermal Simulation
IES Introduction

IES <Virtual Environment> software was used to building a 3D model of the Distribution Centre which enabled us to run thermal simulations for the purpose of calculating HVAC

Cooling Loads. The software was also used to analyze in detail the effect of certain passive design techniques on the HVAC cooling loads for specific areas of the Distribution Centre. It is important to note that the simulation of a building / development is an iterative process and requires a number of reports, meetings, and simulations to achieve the optimum solutions taking all aspects of the project into account.

Methodology

The Thermal Simulation methodology to date has consisted of the following distinct tasks;

a) The 3D model was built based on the latest architects drawings (up to 20th April 2010) using the geometrical, constructional, and operational details supplied.
b) A series of comprehensive checks were then carried out to test the model and a number of preliminary simulations were conducted to verify the accuracy of the model.

The base simulation results, have been calculated using high performance glass, very typical of the Middle East. A 15% margin has been added to these results to allow for flexibility in the design.

A further 10% margin has been added for pipe distribution losses. The cooling load results range from just under 200W/m2 to just over 250W/m² which would be in line with recommended guidelines.

The four different passive design options for the east facing glazed mezzanine offices have shown to deliver between 8% to 12% reductions in the cooling loads. The most effective is by improving the air tightness which emphasizes the importance of maintaining quality standards in the buildings construction.

The overhang options analyzed show that the 1.0m overhang brise soleil compared with a 0.5m overhang brise soleil has no significant effect on the cooling load of these rooms.

This demonstrates that the majority of heat gain is when the sun is orientated directly above the building, which is characteristic of Oman.

Five options have been assessed for this part of the building. 10% to 15% reductions have been achieved using the options as listed in Section 4.4. Air tightness has again shown that it is the most effective strategy of reducing the cooling loads. The 8 no. brise soleil fins are shown to make no significant difference in reducing the cooling load compared to the 5 no. brise soleil fins. The overhang option has also proved effective in reducing the cooling load and while the % reduction in cooling load is slightly worse than the 5 no. fins it may be a more cost effective option.

Seasonal Commissioning:
On many projects once the building has been constructed, commissioned and handed over the buildings systems can get left behind and forgotten about.

Seasonal commissioning will be carried out during the first year of occupation, post construction. This involves;

a) Testing of all building services under full load conditions, i.e. cooling/ventilation equipment in mid-summer, and under part load conditions (spring/autumn/winter).

b) Where applicable, testing should also be carried out during periods of extreme (high or low) occupancy

c) Interviews with building occupants (where they are affected by the services) to identify

problems or concerns regarding the effectiveness of the systems

d) Re-commissioning of systems (following any work needed to serve revised loads), and incorporating any revisions in operating procedures into the O&M manuals.

In the case of the Distribution Centre the freezer chamber refrigeration systems we have included in the specialist commissioning agent's responsibilities. The requirement for a Specialist Commissioning Agent to be appointed and for Seasonal Commissioning to be carried out for a minimum period of 12 months post occupation can be included in our tender documentation for inclusion by the bidding contractors.

Occupant and/or Daylight Controlled Switching:

A daylight linked automatic lighting control system should be provided to minimize energy consumption related to the lighting installation. Systems comprise both absence detection and daylight linking so that lighting does not remain on when it is not required or when there is sufficient diffuse external daylight available.

A properly commissioned automatic lighting control system can result in a reduction of 60-80% in lighting energy costs if sufficient daylight is available (i.e. 3-5% average daylight factor on the working plane.) An automatic lighting control system can also reduce the maintenance cost of the lighting installation as it prologues the apparent lifetime of lamps.

The system proposed is an 'Auto On / Dimmed' lighting control system where the control system switches the luminaire(s) automatically on whenever there is presence in the illuminated area, and automatically switches them to a state with reduced light output (of no more than 20 % of the normal 'on state') no later than 15 min after the last presence in the illuminated area. In addition, no later than 15 min after the last presence in the room as a whole is detected, the luminaire(s) are automatically and fully switched off (All timers are adjustable by the operator). The use of such a system allows the client to achieve better energy ratings for their buildings and also helps achieve the requirements of the European Energy Performance for Buildings Directive energy targets. (Admittedly not applicable in the Middle East but is considered good practice).

Heat Recovery:

By providing heat recovery on the Offices and Accommodation Block central Air Handling Plant, the exhaust air from the space can be used to pre-cool the fresh outdoor air which may be up to 50oC. This will reduce the chilled water energy requirements from the central refrigeration plant. This will be

included for in our tender designs but an option without heat recovery can be included for cost comparison.

Ground Heating

A network of underground pipes are being provided to distribute warm ambient air under the facility in order to negate the risk of ground frost and structural damage to the warehouse floor slab (particularly under the -25oC chambers). This system uses the naturally high external ambient air typical to Oman and avoids having to use a fossil fuel heating system, or similar, to prevent the occurrence of ground frost.

Water Conservation Management Techniques

Sanitary Supply Shut-Off – Small water leaks can result in significant losses over time, increasing costs as well as causing damage. There is a significant risk of leaks going undetected, particularly as toilet accommodation is often unoccupied for long periods. A proximity detection shut-off system prevents wasted water from minor leaks by shutting off the water supply when toilet accommodation is not occupied.

Valves in cisterns supplying urinals and WCs are especially prone to failure, leading to wastage of water via the overflow. Whilst leakage from any valve is variable, a typical value for a leaking valve toilet might be 4 liters / day.

With proximity detection shut-off solenoid valves are installed on the water supply to each toilet area in the building and the flow of water through that supply is typically controlled by a link to infra-red movement detectors within each toilet facility. Sanitary shut-off will be priced as an option for the operational and mezzanine office toilet areas.

Similarly for the accommodation block, sanitary shut-off can be priced as an option for each flat, however, should these flats be occupied during the day as well as night due to shift patterns then the requirement for proximity detection is negated. Leak Detection – A leak detection system can simple use area sub-meters / data loggers to provide an alarm (audible as well as on the BMS) at a flow rate above a pre-set minimum for a pre-set period of time.

Main design parameters for water conservation management techniques;

a) Different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods
b) Programmable to suit the water consumption requirements
c) Designed to avoid false alarms caused by normal operation of large water-consuming plant.
d) Aerated & One Touch Taps – An aerator is a device insert fitting fitted to standard taps that restricts the flow of water from a tap without reducing water pressure.

e) The insert regulates the water flow. For a wash hand basin, a 5 liter /minute aerator is generally used and a 7.6 liter/minute aerator for sinks.

f) The device introduces air into the water stream which softens the stream and reduces water flow. A spray flow aerator spreads the taps water stream over a wider area, suitable for washing hands.

g) One touch tap fittings can prevent wastage by avoiding continuously running taps. Water savings of more than 50% can be made by using aerator fittings to reduce water consumption. Lower Capacity Baths – Lower rated bath capacity of say 130 liters can produce significant water savings compared to standard baths which typically have capacity of 230 to 300 liters

h) Shower Restrictors – Shower restrictor heads at 7 liters/minute reduce water consumption from the typical flow rate of 10 -12 liters/minute.

i) 'Water saver' shower heads work similar to the aerators by creating finer drops by introducing air into water flow. The shower heads typically work at flow rates between 4 to 10 liters/ minute.

Energy Efficient Lighting in Office / Admin Areas:

An essential part of any lighting design is to achieve the design lighting levels whilst minimizing energy consumption. Guidelines on the proper selection of energy efficient lamps and lighting technologies are published by most environmental sections of governments throughout the world.

There are several different methods of ensuring energy efficient lighting design practices published by various international lighting organizations from the simple maximum watts/m2 to the European Energy Performance of Building Directive's complicated LENI (Lighting Energy Numeric Indicator [calculated in kWh/m² x year]). The essential aim of these regulations/recommendations is to promote energy efficient design which in turn reduces energy costs for buildings. Currently the guidelines are not particularly stringent (e.g. for grade 3 offices with automatic lighting control, a LENI figure of 55.8 kWh/m² x year is required).

An inherent part of this process is the selection of energy efficient lamps and lighting technologies. Many international organisations prescribe the use of lamps with low lumens/watt (i.e. less lighting output per watt). In some cases the LOR (light output ratio) (or the amount of light that actually reaches the working plane compared to the amount of light produced) is also regulated.

LED Lighting:
Though LED lighting technology is in its infancy we have incorporated into most design areas of the facility to realize low energy consumption benefits..

Variable Speed Drives:
Suitable all pumps and fans will be installed with variable speed drives (VSD's) to ensure that the optimum energy usage is achieved. As well as ramping up and down to match the pump output with the load requirements, the VSD's on the pumps and ventilation fans will be utilised during the commissioning phase to ensure that the required design flow rates and volumes are achieved at minimum system resistance thereby achieving the optimum energy consumption.

Energy Monitoring:
The European Energy performance of buildings directive (2002/91/EC) has a requirement to sub-meter all energy consumption in buildings. While not applicable to non-European countries, we have considered is as good practice with regard to energy usage and conservation. CIBSE Technical Manual 39:2009 gives recommendations on the correct usage and positioning of metering within building services installations.

An essential aspect of any energy management system is the metering of all aspects of energy consumption in a building. It is necessary to have records of energy consumption of all buildings/user/types/departments/functions etc to implement an informed energy saving strategy in any building/process. Sub-metering of all services including water, fuel and electricity makes it possible to determine what parts of a buildings infrastructure or users are using the majority of the energy and thus costing the most.

Sub-metering also allows for highlighting problem areas or changes to routine energy usage patterns in buildings. For this project we have included monitoring for all large load items as standard i.e. refrigeration loads, dehumidification, lighting, domestic hot water (where central plant is used), fans (major), pumps (major), LPG Usage, Kitchen Power Usage, MHE charging stations etc.

Solar Thermal:
Modern solar thermal systems which absorb the sun's energy and provide heat for hot water and other applications are highly efficient.

Solar thermal panels collect and absorb solar radiation, then transfer the solar heat directly to a storage system (e.g. hot water tanks), from which the heat is distributed. If the systems cannot provide adequate heat, an auxiliary or back-up system provides the additional heat. Liquid-based systems are

used when storage is required, and such storage will generally improve the viability of solar thermal installations by matching the availability of hot water to user demand.
The circulation of heat can be either passive (relying on natural convection or water pressure to circulate the fluid through the collector to the point of use) or active (using pumps, which increases the system's efficiency but with additional capital cost requirements for the pump and associated controls).

The level of solar energy density is amongst the highest in the world in Oman and a suitably sized system could produce over 50% of the annual hot water consumption.

The accommodation block has the highest hot water demand in the facility with showers, laundries and kitchen areas all concentrated in the one building. We have therefore designed the a central hot water system fed by a 34m2 array of evacuated tube solar hot water panels located on the roof. An option for electric only hot water storage can be included in the tender documents should the budgets dictate.

3. Impact

How has the project/initiative/work motivated others to contribute to a greener Oman:

The benefit will be visible for other to follow-suit in constructing a low energy facility when AMLS start operating the facility.

Guaranteed benefits outlined below will prove too much to resist for Warehouse operators in Oman:

a) Low energy design thus low cost operations.
b) Paperless operations
c) Recyclable pallets
d) Battery Operated Material Handling Equipment (cleaner working environment; zero diesel fumes/smokes)
e) Conducive working environment thus improved productivity and low employee turnover
f) Entice world class brands to set-up distribution network in Oman with availability world class green facilities where they will be able to gain tax incentives/breaks
a) High cube design for cost benefits

4. Originality and Leadership

How has the nominee demonstrated vision, foresight and persistence?

AMLS is the 1st in Sultanate of Oman to embark on green Warehouse initiative. We believe in near future global brands would not want to establish business relationship with non-green operators. Therefore it is absolute critical for local operators to take lead on establishing such facilities to remain competitive and be seen globally as a responsible nation.

In Sultanate of Oman, AMLS want to be seen as a leader and we are 100% committed to be the 1st and continue to be the leader in green logistics initiatives in Sultanate of Oman.

5. Continuity & Sustainability

5.1 How sustainable is the initiative carried out?

Continuity & Sustainability is in build into our culture, business plan and ways of working. All our facilities and ways of working both present and future has high level of green elements incorporated to ensure we continue to sustain the demands of our clients and also to ensure we continue to sustain as the leader in Green Logistics.

5.2 Explain how it will be effective in the long term;

KEY Long term benefits as following:

Evidence is guaranteed that sustainable buildings provide financial rewards for building owners, operators, and occupants. Sustainable buildings typically have lower annual costs for energy, water, maintenance/repair, churn (reconfiguring space because of changing needs), and other operating expenses.

In addition to direct cost savings, sustainable buildings can provide indirect economic benefits to both the building owner and society.

For instance, sustainable building features can promote better health, comfort, well-being, and productivity of building occupants, which can reduce levels of absenteeism and increase productivity. Sustainable building features can offer owners economic benefits from lower risks, longer building lifetimes, improved ability to attract new employees, reduced expenses for dealing with complaints, less time and lower costs for project permitting resulting from community acceptance and support for sustainable projects, and increased asset value.

Indirect or longer-term economic benefits:

a) Better worker retention and recruitment
b) Lower cost of dealing with complaints
c) Decreased risk, liability, and insurance rates
d) Greater building longevity
e) Better resale value
f) Ease of siting
g) Strategic and economic value of an improved image.