ENERGY STATEMENT

MECHANICAL AND ELECTRICAL ENGINEERING SERVICES

General

The mechanical and electrical engineering services will accord with the energy strategy set out in Stockton on Tees, Borough Council, Local Development Framework (LDF) Supplementary Planning Document No.1 - Sustainable Design Guide, the proposed design has been based on the following approach.

First Priority

The design and fabric of the building has been prioritised to achieve a high level of energy efficiency, the thermal transmittance (u-values) exceed the minimum requirements of the Building Regulations, as indicated below, an overall improvement of 15% will be achieved.

Fabric	**Proposed Thermal Transmittance Values (W/m^2K)**	**Building Regulations Thermal Transmittance Values (W/m^2K)**
Roof	0.21	0.25
Wall	0.30	0.35
Floor	0.21	0.25
Glazing	1.90	2.20
Vehicle Access Doors	1.50	1.50

In addition a minimum air permeability rate of $7m^3/m^2$/hour will be provided

Heat Source

In line with the governments recent de-carbonisation strategy for public sector buildings and the LDF Sustainable Design Guide recommendations, the intention is to provide a renewable heat source utilising air source heat pumps to provide heating to all areas of the building.

There will be two approaches to heating the building comprising :-

- Workshop Areas, Stores, Parts Warehouse, Showroom and Toilet Areas

  These areas will be provided with underfloor heating operating at 45^oC flow/38^oC return.

  A dedicated modular air source heat pump arrangement will operate at 45^oC flow/38^oC return temperatures to meet the underfloor heating requirements.

  At these operating temperatures the ASHP(s) will achieve high levels of efficiency, typically COP of 3.38 at 7^oC ambient.

- Office Areas, Meeting Rooms, Training Areas and Canteens

Where there is a need to provide both heating and comfort cooling in the offices, meetings rooms, training rooms etc., the Mitsubishi variable refrigerant flow (VRF) direct expansion type air conditioning system will be utilised.

In this case the heat source will be modular high efficiency inverter driven air source heat pumps, with the technology to simultaneously provide heating and cooling with the added benefit of heat recovery.

Natural Ventilation

Within the main workshop area sufficient fresh air ventilation will be achieved by the regular usage of vehicular access doors.

Within the vehicle showroom again natural ventilation will be provided, this will be automatically controlled via a combined temperature and air quality sensor to prevent overheating and maintain a good level of air quality with negligible energy input.

Mechanical Ventilation

With the exception of the vehicle showroom all areas in the two storey block will be provided with mechanical fresh air ventilation, the volume flow rates will be designed to comply with CIBSE guidelines based on occupancy levels or in the case of toilet and store rooms to achieve the recommended air changes per hour.

Three Mitsubishi Lossnay units will provide supply and extract ventilation to all areas via sheetmetal ductwork arrangements.

The units incorporate heat recovery capable of achieving 75% heat exchange efficiency.

This approach ensures complete control of the amount of fresh air entering the two storey block in order to achieve maximum operating efficiencies.

Domestic Hot Water Services

The demand for domestic hot water is small and limited to wash hand basins in toilet facilities, showers (2No.) hand washing facilities in the workshop and brew stations in the canteens.

Given demand is limited it is proposed to install a central domestic hot water service storage cylinder with a hot water service flow and return distribution system.

The required electrical input to the electric immersion heaters will be offset by the electric generated by the roof level PV system.

Thermal Insulation

All pipework and ductwork will be thermally insulated to a high standard to minimise standing losses, typically Kingspan Kooltherm rigid phenolic insulation

Photovoltaic System

A photovoltaic system will be installed in the form of a roof mounted PV array to the South East and North West facing sections of roof. The PV array will cover approximately 300m^2 of the roof area over the showroom/office accommodation area of the building.

It is anticipated that the PV array will have a capacity of circa 27kWp which can be utilised throughout the building for lighting, power and heating applications.

Lighting Controls

Lighting installations within the office/ancillary areas will utilise automatic controls in the form of presence and absence detection to maximise energy efficiency.

External lighting installations will be controlled via photocell and time clock to maximise energy efficiency and comply with any planning restrictions.

Lighting Installations

All internal and external lighting installations will utilise energy efficient LED luminaires with a minimum efficacy of 80lm/W.

Provision of Renewable Energy

The following calculation demonstrates how the minimum 10% renewable energy requirement will be met.

Total predicated heat and power loads

			Output		Input
1.	Heating Installation				
	Underfloor heating load	=	196kW		
	VRF system heating load	=	32kW		
			228kW		
	Based on COP of 3.4 (7°C ambient) power input	=			(67kW)
	Based on COP of 2.59 (-6°C ambient) power input				88kW
2.	Domestic Hot Water Services :-				
	300 litre storage vessel with 3No. 3kW immersion heaters	=	9kW		
3.	Lighting :-				
	Total lighting load	=	29kW		
4.	Small power :-	=	26kW		
5.	PV Array				27kW
	Total heat and power load at peak demand	=	292kW		
	Total renewable energy input	=			115kW
	Percentage renewable energy	=	115/292	=	39%