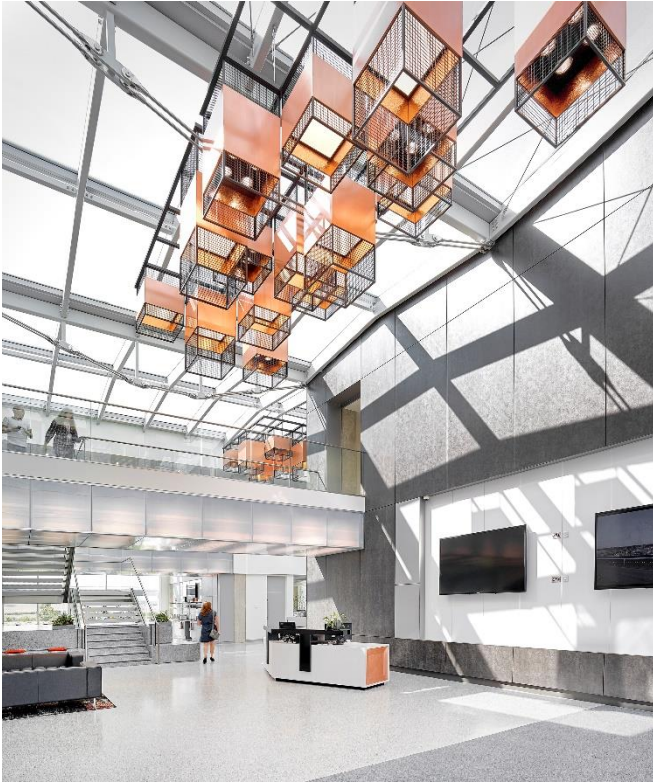


# Cascades Leisure Centre

## Energy and Low Carbon Technology Statement



Issue No. 06

Date: 12<sup>th</sup> January 2026

Ref: 2312-50-RPT-01

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Checked: Danny Strickland



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## 1.0 EXECUTIVE SUMMARY

This Energy and Low Carbon Statement has been prepared by Desco to accompany an application made under Section 73 of the Town and Country Planning Act (1990) for an amendment to planning permission ref. 20221293 for the redevelopment of the Cascades Leisure Centre site in Gravesend. The application is submitted on behalf of Gravesham Borough Council.

Our proposals are to demolish the existing building that is old, tired, inefficient by current energy and carbon standards and towards the end of its lifespan. This existing building is to be replaced with a new building that is to be built to a higher standard than building regulations requires which will equate to an extremely energy and carbon efficient new building. The new building will incorporate the current building regulations part L notional building fabric 'U-Values' (which are much better than minimum requirements), very low air permeability and a building services strategy that utilises extremely efficient systems (heat pumps) which also produce considerably less carbon when compared to the existing building which is served by gas fired boilers.

For heating and cooling we propose a hybrid approach using Variable Refrigerant Flow (VRF) air source heat pumps for areas requiring both heating and cooling, and Low Temperature Hot Water (LTHW) air source heat pumps (approx. 50°C flow temperature) for heating-only zones. This dual-system strategy optimizes energy performance, enhances occupant comfort, and aligns with sustainability goals by leveraging renewable heat sources.

For domestic hot water (DHW) generation we propose the use of a CO<sub>2</sub> heat pump system which deliver high water temperatures efficiently, all year round, without the need for supplementary electric heating. This is especially beneficial for high-demand areas like leisure centres, offering reduced carbon emissions and supporting sustainability goals using a natural refrigerant with low Global Warming Potential (GWP). This solution aligns with our low-carbon strategy and enhances the building's overall energy performance.

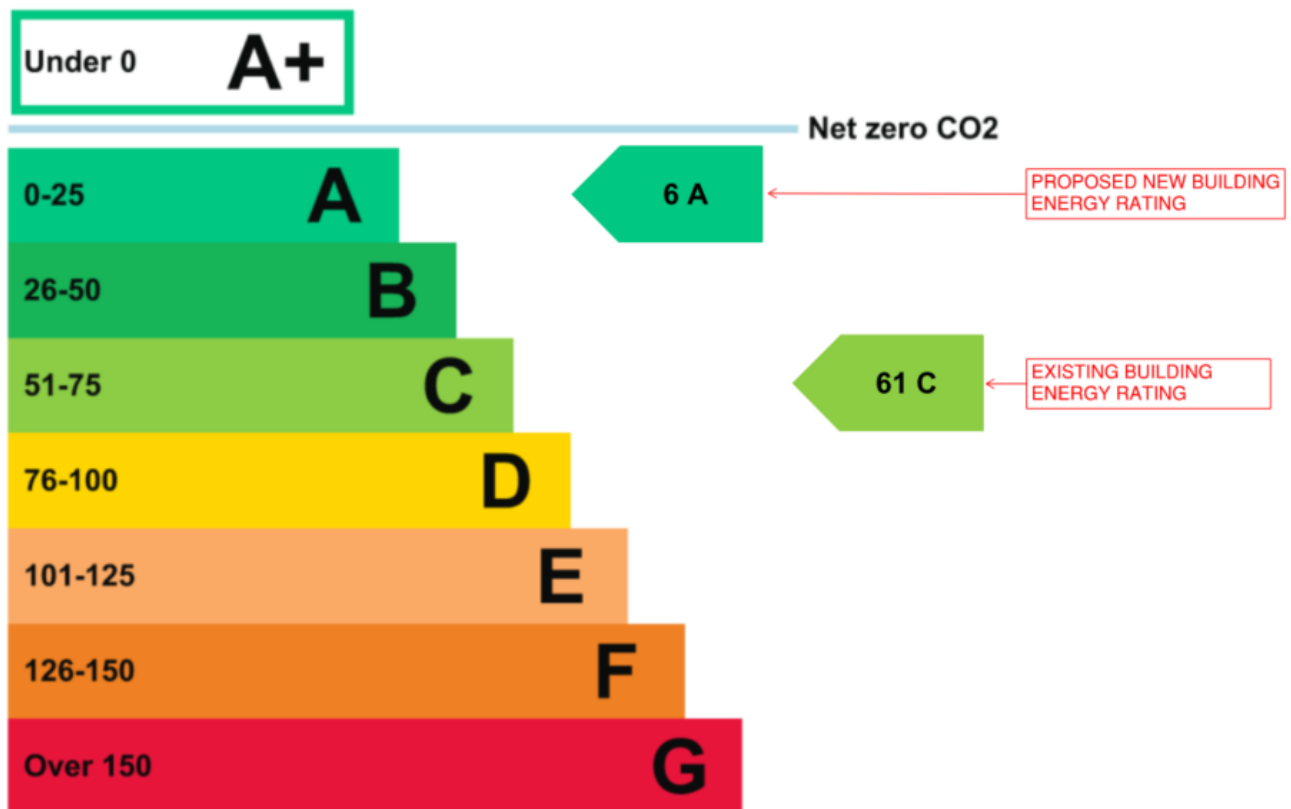
Another element of sustainability the new building will incorporate are Photovoltaic Panels (PV panels) which will be located on the roof. As the heating and cooling to the new leisure centre will be electrically driven via heat pumps as mentioned above, the electricity generated by solar PV panels will help to offset the requirements of running the heat pumps and will work in tandem to reduce the buildings energy demand from the grid, and reduce the running costs of the heating, cooling and hot water systems.

The proposed building significantly outperforms both the existing facility and current Building Regulations Part L requirements. It achieves carbon emissions five times lower than the existing building and 10% lower carbon emissions and primary energy use than required by current regulations. The building is expected to achieve an EPC rating of A, it approaches net zero performance and aligns with future grid decarbonisation plans, representing a major upgrade over the current mid-range EPC C-rated building.

**Proposed new building performance compared to the existing building:**

- A reduction of **414 tonnes** CO<sub>2</sub>/year, resulting in a **79%** improvement and **12,420 tonnes of CO<sub>2</sub> saved** over a 30-year building lifespan
- A **66%** reduction in primary energy usage
- An EPC rating of **A-6**, compared to the existing buildings EPC rating **C-61**

## Energy rating and score



The above graphic identifies a direct comparison of the existing Cascades leisure centre and the proposed new building energy ratings.

## **2.0 INTRODUCTION**

This Energy and Low Carbon Statement has been prepared by Desco to accompany an application made under Section 73 of the Town and Country Planning Act (1990) for an amendment to planning permission ref. 20221293 for the redevelopment of the Cascades Leisure Centre site in Gravesend. The application is submitted on behalf of Gravesham Borough Council.

This report looks at the sustainability requirements and proposals for the development of Cascades Leisure Centre located in Gravesend in Kent. The report identifies the proposals for the scheme and how they achieve regulatory compliance at both national and local level and go beyond just compliance.

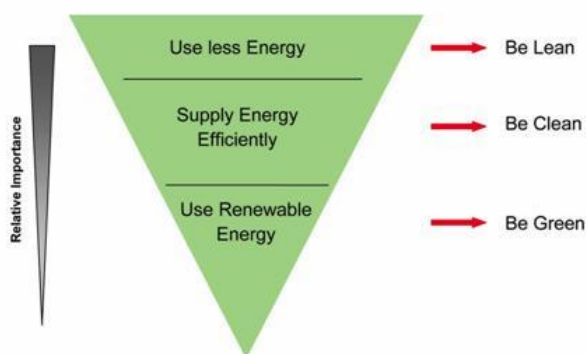


The building shown in the image above is the existing leisure centre, which was constructed in the 1960s and 70s. The proposal is for the existing building to be demolished and a new leisure centre to be built on the same site, bringing the building and services up to modern efficiency standards. The new building is proposed to be built approximately where the existing carpark and treeline are in the foreground of the above image.

This report identifies the proposed new build elements, how energy efficiency will be incorporated into the design, and how this new building greatly improves upon the existing building and its services.

### 3.0 SUSTAINABILITY APPROACH

Our approach to design is to design in line with the energy hierarchy, be lean, be clean and be green, as shown below.



It's important to adopt this method and approach in the order shown above. The strategy is to minimise the amount of energy required, where energy is required; use the energy as efficiently as possible and finally make use of renewable technologies as appropriate.

The starting point to sustainable design is a 'fabric first' approach. Ensuring that the building fabric is to a high standard will reduce heat lost from the building, and in turn reduce the energy required to keep the building operational and the occupants comfortable. Table 1 below shows minimum standards for Building Regulations compliance and the proposed U-values for the new building. The lower the U-value, the better the building fabric performs to retain heat energy within the building. Table 1 shows the proposed U-values are considerably better than 2021's minimum standards for Building Regulations compliance.

**Table 1.**

| Fabric Element         | 2021 Building Regulations minimum U-value (W/m <sup>2</sup> /k) | Proposed U-value (W/m <sup>2</sup> /k)       |
|------------------------|-----------------------------------------------------------------|----------------------------------------------|
| Walls                  | 0.26                                                            | 0.18                                         |
| Floors                 | 0.18                                                            | 0.15                                         |
| Roofs – pitched / flat | 0.18                                                            | 0.16 / 0.17                                  |
| Windows                | 1.6                                                             | 1.33                                         |
| Air Permeability       | 8.0m <sup>2</sup> /(h.m <sup>2</sup> ) @ 50 Pa                  | 3m <sup>2</sup> /(h.m <sup>2</sup> ) @ 50 Pa |

The next step of our strategy is to supply energy efficiently. Our proposals for how we are serving the building are explained within this report and the principles of our design are focused around using highly efficient systems and equipment throughout the building.

The third element of our sustainability approach is to use renewable energy where possible. The proposal to achieve this is the combination of highly efficient electrically driven heat pump systems and renewably generated on site electricity via solar PV panels.

### 3.1 LOCAL REQUIREMENTS

Core Strategy (as amended by the Core Strategy Selective Review 2019), Gravesham Local Plan

The current local plan for this development was amended in 2019. The key elements of that plan with regards to building services are outlined and responded to below.

#### Policy CS18: Climate Change – Section 5.14.41

##### Water Demand Management

5.14.41 The Council will seek to manage the supply of water in the Borough and reduce the impact of new development on the supply of potable water as much as possible. In particular, the Council will:

- Require all new homes to be built to at least level 3/4 of the Code for Sustainable Homes in terms of water use (105 litres per person per day consumption). Where it can be demonstrated that a development is unable to meet these standards, or the additional standards set out below, permission will only be granted if provision is made for compensatory water savings elsewhere in the Borough;
- Seek 5% of homes on Key Sites to act as exemplars by meeting level 5/6 of the Code for Sustainable Homes in terms of water use (80 litres per person per day consumption);
- Require all non-residential developments of 1,000 sq m and above to meet the BREEAM "excellent" standards of water efficiency and include provision for the collection of rainwater; and
- Support proposals to retrofit existing residential properties in ways which reduce water consumption.

- (i) *'Require all non-residential developments of 1,000 sq m and above to meet the BREEAM "excellent" standards of water efficiency and include provision for the collection of rainwater'*

BREEAM has two criteria for water efficiency. Wat 01 and Wat 02. To achieve BREEAM 'excellent' standards in line with the local plan we propose the following:

Wat 01 is an assessment of the efficiency of the buildings domestic water-consuming components and the general water consumption compared against a baseline performance. There are five credits available for the Wat 01, to achieve a BREEAM 'excellent' rating we need a minimum of one credit from this item. One credit requires a 12.5% improvement over the baseline water consumption of the building and to achieve this there will be careful consideration on the selections of sanitaryware to ensure the water outlets are the low water usage type. Flow restrictors will also be considered if necessary to ensure the domestic water systems will meet the low water usage requirements of policy CS18 section 5.14.41.

The above policy also refers to making provision for rainwater collection and while we understand the desire and drive for sustainable design principles, our proposal is to not install a rainwater harvesting system as we are proposing an alternative strategy that will both reduce water consumption and increase efficiency.

The proposed alternative strategy is to utilise microfiltration for the pool water instead of a traditional media bed filtration system (sand filtration). This approach significantly reduces the volume of water discharged during backwashing, thereby minimizing water wastage and lowering the building's overall water consumption.

In addition to water savings, microfiltration systems generally operate with lower energy demands compared to conventional media bed systems, due to reduced pumping requirements. While the pool's filtration and heating systems are classified as process loads and therefore excluded from SBEM calculations and the BRUKL output, their implementation will nonetheless contribute to tangible improvements in the building's actual energy efficiency.

#### Policy CS18: Climate Change – Section 5.14.42

##### Carbon Reduction

**5.14.42 The Council will seek to reduce the overall carbon footprint of the Borough. In particular, the Council will:**

- In the context of national policy on the transition to zero carbon development via amendments to Part L of the Building Regulations, require proposals for development of the Key Sites throughout the Borough and other major development elsewhere in the Gravesend Town Centre Opportunity Area to consider the potential and include proposals for low carbon and renewable energy generation, including combined heat and power. Where choosing not to do so, applicants must submit evidence which demonstrates that compliance is not technically or financially feasible or that improved fabric energy efficiency or an allowable solution results in improved carbon saving benefits;
- Support stand-alone decentralised, renewable or low carbon energy development where it is compatible with national policies for protecting the Green Belt and where it accords with policies in this plan, in particular those relating to Development and Design Principles, Transport, Green Infrastructure, and Heritage and the Historic Environment; and
- Support other proposals which lead to a reduction in carbon footprint including the retrofitting of existing homes and businesses, including local initiatives based on carbon off-setting via allowable solution

- (i) *'In the context of national policy on the transition to zero carbon development via amendments to Part L of the Building Regulations, require proposals for development of the Key Sites throughout the Borough and other major development elsewhere in Gravesend Town Centre Opportunity Area to consider the potential and include proposals for low carbon and renewable energy generation, including combined heat and power. Where choosing not to do so, applicants must submit evidence which demonstrates that the compliance is not technically or financially feasible or that improved fabric energy efficiency or an allowable solution results in improved carbon saving benefits'*

When Combined Heat and Power units (CHPs) were introduced to the UK they were seen as an energy efficient solution to provide both heat and power to buildings while reducing carbon footprint and energy bills. However, since the latest update to Part L of the Building Regulations gas driven systems no longer outperform electrically driven systems when calculating the carbon emissions of a building within the SBEM calculation, therefore burning gas (which now performs worse under the new Part L) to generate electricity (which now performs much better under the new Part L) is counter intuitive when there are other technologies available that are electrically driven and provide heat at much higher efficiencies – such as heat pumps. CHPs are approximately 85% efficient so for every 1kW of gas input a modern CHP engine produces approximately 0.4kW of electricity and 0.45kW of hot water.

Air source heat pumps typically have an average Coefficient of Performance (COP) of approximately 3.0. This means that for every 1kW of electrical energy input to the heat pump it produces 3.0kW (on average, this will be higher in warmer weather and may be lower in colder weather). As can be seen above, heat pumps are much more efficient than CHP units, and not only that but they produce much less carbon based on the current Part L Building Regulations.

To optimise building performance and support long-term sustainability goals, we propose a hybrid approach for heating and cooling using two complementary air source heat pump technologies:

- Variable Refrigerant Flow (VRF) air source heat pumps will serve areas requiring both heating and cooling. These systems offer high efficiency, flexible zoning, and precise temperature control, making them ideal for spaces with variable occupancy and diverse thermal demands.
- Low Temperature Hot Water (LTHW) air source heat pumps, operating at approximately 50°C flow temperature, will be deployed in heating-only zones. This lower-temperature system is well-suited to modern building envelopes and underfloor heating applications, delivering efficient performance while reducing energy consumption.

This dual-system strategy allows us to tailor the thermal solution to the specific needs of each zone, improving overall energy efficiency, enhancing occupant comfort, and reducing operational carbon emissions. By leveraging renewable heat sources, the approach aligns with the building's environmental objectives and supports compliance with future regulatory standards.

For domestic hot water (DHW) generation, we propose the use of a CO<sub>2</sub>-based heat pump system. These systems can deliver high water temperatures efficiently, even in colder ambient conditions & without the need for supplementary electric heating. This makes them particularly advantageous for high-demand environments such as leisure centres, where consistent and reliable hot water supply is critical. CO<sub>2</sub> heat pumps use a natural refrigerant with a low Global Warming Potential (GWP), contributing to reduced carbon emissions and supporting the building's low-carbon strategy. Their ability to maintain performance in challenging conditions ensures resilience and long-term operational efficiency, while also enhancing the building's overall energy profile.

Our proposal will provide considerable energy and carbon savings over an equivalent system using CHP.

### 3.2 BUILDING REGULATION'S PART L

As the proposal is to build a new leisure centre building to replace the old existing building, the requirements of Approved Document L (2021) apply. However, we are designing the building to standards which outperform the minimum requirements of the latest part L of the Building Regulations across the board, therefore complying with Approved Document L will be easily achieved, as demonstrated below.

#### Building Fabric

As stated in our sustainability approach, the key first step for us to achieve a very energy efficient building is by starting with a 'fabric first' strategy. The proposed building fabric U-values and air tightness figures identified in table 1 are a considerable improvement over minimum building regulation requirement. These proposed figures match the respective notional building values that are used in comparison against the proposed building within the Simplified Building Energy Model (SBEM) calculation, and as such the proposed building will perform favourably on the calculation.

The existing building's U-values are unknown so we are unable to provide a specific comparison, although it is quite clear that the proposed U-values of the new building will be a drastic improvement over the current existing building's fabric. This is clear to see due to the gradual progression and stringent targets set by the Building Regulations over time since the existing building was built (1960s), as well as the proposal outperforming even the most recent targets from the current Building Regulations Part L (2021)

#### Energy Efficient Systems

The energy efficient systems that we are proposing for the new building are as follows:

- **Variable Refrigerant Flow (VRF) air source heat pumps with heat recovery**

This system is highly efficient systems designed to serve areas of a building with a predominant cooling demand, while also providing heating when required. These systems operate by circulating refrigerant directly to multiple indoor units, allowing for precise temperature control across different zones. A key advantage of VRF systems is their integrated heat recovery capability, which enables simultaneous heating and cooling within the building. When one zone requires cooling, the system captures the waste heat generated during that process and redirects it to another zone that requires heating. This internal energy redistribution significantly reduces the overall energy consumption, making the system particularly efficient in buildings with diverse thermal demands.

- **2 pipe air source heat pumps (ASHP)**

We propose that this system is used to serve areas of the building which require heating only. Its design is simple and cost-effective, using just a flow and return pipe to distribute heated water from the ASHP to terminal units like radiators or under floor heating manifolds. The system is energy-efficient, especially in temperate climates, delivering significant carbon savings by extracting renewable heat from the air. 2-pipe ASHP systems offer a reliable, low-carbon solution for heating-dominant zones, supporting both sustainability goals and

operational efficiency.

- **CO<sub>2</sub> heat pumps**

We propose the use of CO<sub>2</sub>-based heat pumps to serve the building's domestic hot water requirements. These systems are highly efficient and environmentally friendly, utilising natural refrigerant (CO<sub>2</sub>), which has a low global warming potential and excellent thermodynamic properties for high-temperature water production. Unlike conventional heat pumps, CO<sub>2</sub> systems can reliably deliver hot water temperatures above 60°C, making them ideal for DHW applications without the need for electric immersion heaters or supplementary heating. Their performance remains robust even in colder climates, and they are particularly well-suited to buildings with continuous or high-volume hot water demand. By leveraging renewable energy and a natural refrigerant, CO<sub>2</sub> heat pumps contribute significantly to achieving decarbonisation targets for leisure centre schemes.

- **Pool filtration via Microfiltration**

We propose utilising microfiltration technology for this project due to its superior energy and water efficiency compared to traditional media bed systems such as sand filtration. Microfiltration operates at a lower filtration rate while maintaining high water quality, which significantly reduces the pumping power required to circulate water through the system. This results in lower electrical consumption and operational costs. Additionally, microfiltration systems require substantially less water during backwashing procedures, as the process is more targeted and efficient. Since backwash water is discharged to drain, minimising this volume directly reduces the need for fresh water top-up, which in turn lowers the energy demand for reheating replacement pool water. This contributes to a reduction in overall pool heating requirements and supports broader sustainability and carbon reduction goals.

#### BRUKL and EPC Results

We have carried out an initial assessment and calculation of the proposed development based on the current Building Regulations Part L documentation that was updated in 2021 and came into effect for new building applications on 15<sup>th</sup> June 2022. The information input to the calculation software is based on the services strategies explained within this report with the following results.

#### **Carbon Emissions** (kgCO<sub>2</sub>/m<sup>2</sup> per annum)

- Target CO<sub>2</sub> Emission Rate (TER): **18.86**
- Building CO<sub>2</sub> Emission Rate (BER): **17.07**
- Existing Cascades BER: **84.46**

**Our proposals produce 10% less carbon than a modern Building Regulations compliant building and only 21% (almost one fifth) of the existing facility carbon emissions.**

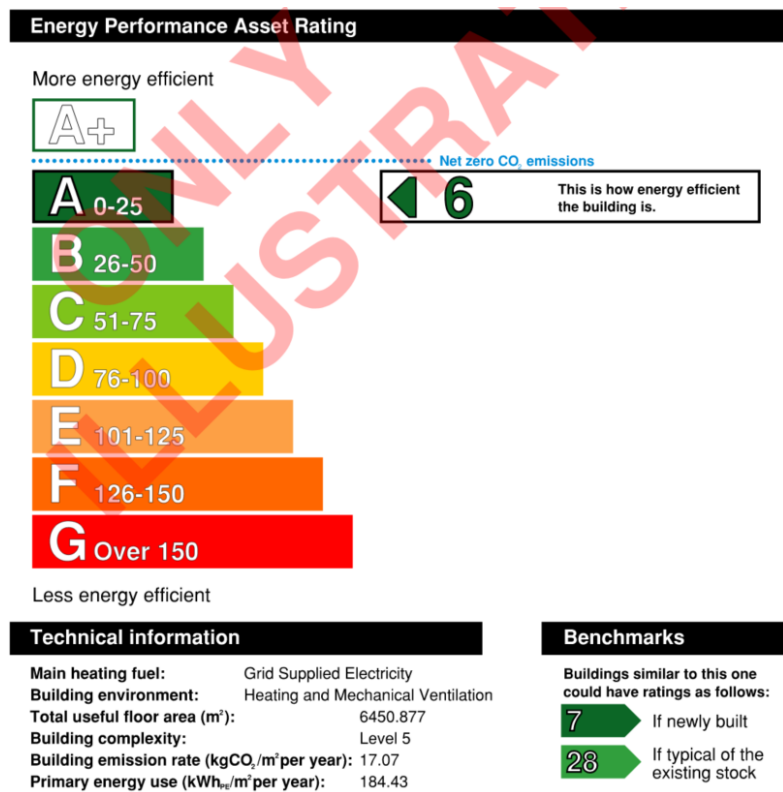
#### **Primary Energy** (kWh/m<sup>2</sup> per annum)

- Target Primary Energy Rate (TPER): **204.6**
- Building Primary Energy Rate (BPER): **184.43**

**Our proposals use 10% less energy than a Building Regulations compliant building.**

Predicted EPC Rating

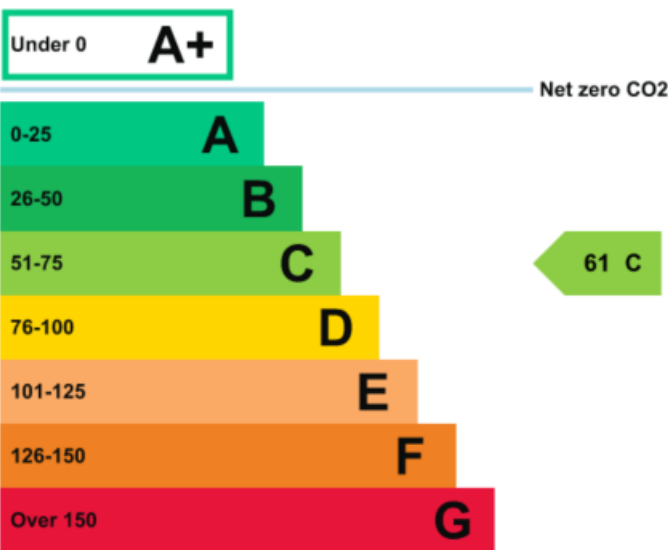
The following image indicates the predicted EPC rating of the building.



The predicted EPC rating for the proposed development is a band A and close to a net zero carbon building (above), while the EPC rating for the existing building is a mid-range C rating (below)

Energy rating and score

This property's energy rating is C.



### **3.3 BE LEAN**

#### Building Thermal Performance

As demonstrated above, the building is much better than the minimum standards of fabric performance, as required by Approved Document L.

Ensuring the building fabric is efficient is the cornerstone of any buildings energy strategy and we have demonstrated that here.

#### Reduce Solar Gain

There has been consideration to the amount of glazing on the building to strike a balance between enough glazing to maximise natural light to reduce lighting energy usage but restrict the amount of glazing to reduce the potential of overheating to internal spaces via solar gain.

#### Natural Daylight

The proposed building makes use of roof lights in certain spaces to maximise natural light where possible, and vertical windows.

Our proposals will make maximum use of the daylight, by combining this with artificial lighting which will reduce the output when the amount of natural daylight allows.

### **3.4 BE CLEAN**

Where energy is used, the design will ensure that energy use is minimised by looking at the following.

#### High Efficiency Fans

Where fans are required, the design will ensure that fans are efficient as possible, thus reducing the amount of electrical energy required. These will be improved over the minimum requirements of Approved Document L2A where possible.

The existing building likely doesn't make use of modern high efficiency fans.

#### Ventilation Heat Recovery

The design will make use of Mechanical Ventilation Heat Recovery (MVHR). The use of MVHR units minimise the heating requirement of the building. MVHR is used across almost the whole building. The MVHR units will have a minimum heat recovery efficiency of 75%, however the likelihood is that a much better heat recovery efficiency than this will generally be achieved, especially in the pool hall which is a very energy demanding space. The heat recovery of the pool hall can expect to be upwards of 90% efficient.

The existing building services are largely unknown, but it is likely that the existing buildings ventilation systems either do not incorporate heat recovery, or if they do, they likely to be much less efficient than the proposed new systems, thus our proposals will be significant improvement over the efficiency of the existing building's ventilation.

#### LED Lighting

The whole of the proposed artificial lighting installation will make use of high efficiency LED lighting. This is likely a significant upgrade on the existing buildings light fittings.

#### Lighting Controls

The design will incorporate automatic controls to lighting to limit the use of artificial light where appropriate as follows.

Presence detection – Where suitable, a detector will automatically switch lighting on when the room is occupied and switch lighting off when people leave the room.

Absence detection – In some areas it can be more suitable to provide a switch to turn lighting on and have lights switch off automatically when people leave the room. Where suitable, this will be incorporated.

We will also make use of daylight sensors, with daylight dimming, allowing fittings to reduce output when natural daylight levels allow.

#### Variable Speed Fans

All fans will be provided with variable speed motors, which can vary their speed. The use of such fans greatly minimises the use of electrical energy.

### 3.5 BE GREEN

The above measures reduce the requirements for energy by good design first, then where energy is required, good design and careful selection of appropriate systems uses that energy as efficiently as possible.

The final element of the hierarchy triangle is to use green technology where required and where appropriate. Below we outline our proposals for this development.

#### Heat Pumps

Our proposals for the scheme are to make use of air source heat pumps throughout. The heat pumps will provide heating, cooling and domestic hot water.

The existing building used natural gas fired boilers to provide the heating, so the use of heat pumps for the proposed building is a significant improvement on the carbon emissions of the building when compared to the existing building.

#### Solar PV Panels

The development will utilise solar PV panels on the roof where possible. As the proposed building systems are electrically driven, the building will have a relatively large electrical demand. Solar PV panels will help to offset this by providing a clean and renewable source of electricity on site.

#### Electrical Vehicle Chargers

Building Regulations require a minimum of 1 electric vehicle charger for a new development such as this. Our proposals are to provide an improvement on this by providing 7.2kW chargers to 10% of the parking spaces.

Building regulations Part S requires 20% of the parking spaces to be provided with cable ducting. As 10% of the spaces are to be provided with installed chargers, the other 10% will be provided with ducting only for future electric vehicle chargers.

#### 4.0 SUMMARY

Our proposals are to provide the following.

- A highly energy efficient building with a 'fabric first' approach to minimise the energy requirements of the building.
- The new building is proposed to be constructed in accordance with performance benchmarks that align with the notional building values used for comparison within the Simplified Building Energy Model (SBEM) calculation. The specified standards for building fabric, air tightness, and energy efficiency of building services systems exceed the minimum requirements set out in Building Regulations Part L.
- The building heating and cooling will be provided by heat pumps. This will ensure that the building operates very efficiently with a low carbon footprint.
- The main ventilation systems will all incorporate very high heat recovery to retain as much heat energy within the building as possible and increase sustainability
- Make best use of passive measures, such as high levels of natural daylight where possible and making use of thermal mass to reduce the energy use
- The proposed building will be all electric, thus making the building carbon zero ready as de-carbonisation of the grid occurs in the future.
- A building that performs considerably better than the existing building in terms of energy use and carbon emissions.

## 5.0 ADDENDUM

The following provides information relating to the amendments to 2312-50-RPT-01 Energy and Low Carbon Technology Statement Issue 3, previously issued as part of the planning information.

As per the original proposal all regulated energy use will be electrical.

The building's sustainability strategy has been carefully recalibrated to strike a more pragmatic balance between environmental performance and financial viability. While certain high-cost sustainability features have been moderated, the design still adheres to core principles of energy efficiency and environmental responsibility which still considerably exceeds the latest Building Regulations minimum requirements. This approach attempts to ensure the building remains accessible and deliverable within budget, without compromising its long-term operational performance or user comfort.

## 5.1 MECHANICAL SERVICES

Space heating will be provided using air source heat pumps, providing a low energy, low carbon solution.

Where cooling is required, VRF air conditioning units will be utilised. A key advantage of VRF systems is their integrated heat recovery capability, which enables simultaneous heating and cooling within the building. When one zone requires cooling, the system captures the waste heat generated during that process and redirects it to another zone that requires heating. This internal energy redistribution significantly reduces the overall energy consumption, making the system particularly efficient in buildings with diverse thermal demands.

Domestic hot water will be generated as follows:

The water to water heat pump is no longer proposed and instead the CO<sub>2</sub>-based heat pumps shall be utilised to satisfy the building's domestic hot water requirements. These systems are highly efficient and environmentally friendly, utilising natural refrigerant (CO<sub>2</sub>), which has a low global warming potential and excellent thermodynamic properties for high-temperature water production. Unlike conventional heat pumps, CO<sub>2</sub> systems can reliably deliver hot water temperatures above 60°C, making them ideal for DHW applications

The waste water heat recovery system has been omitted from the scheme in an effort to better balance the project cost and the buildings sustainability performance.

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## 5.2 ELECTRICAL SERVICES

Within the original planning statement 23No vehicle charging spaces were proposed (10% of the total number of spaces). This is still proposed for the current scheme.

In compliance with Building Regulations Part S a further 10% of spaces shall be with the ducting for future electrical vehicle chargers.

### 5.3 BUILDING FABRIC

The building will be designed to minimise the requirement for heat throughout and will target the U values and air permeability to help achieve this.

The original Passivhaus U values are proposed to be relaxed, working instead to building regulation notional limits, which are an improvement over building regulation minimums. See table 1.

Table 1.

| Fabric Element   | Passivhaus U-Value                               | Building Regulations Minimum U Values          | Proposed U-value                                 |
|------------------|--------------------------------------------------|------------------------------------------------|--------------------------------------------------|
| Walls            | 0.1 W/m <sup>2</sup> K                           | 0.26 W/m <sup>2</sup> K                        | <b>0.18 W/m<sup>2</sup>K</b>                     |
| Floors           | 0.1 W/m <sup>2</sup> K                           | 0.18 W/m <sup>2</sup> K                        | <b>0.15 W/m<sup>2</sup>K</b>                     |
| Roofs            | 0.1 W/m <sup>2</sup> K                           | 0.18 W/m <sup>2</sup> K                        | <b>0.16 / 0.17 W/m<sup>2</sup>K</b>              |
| Windows          | 0.82 W/m <sup>2</sup> K                          | 1.6 W/m <sup>2</sup> K                         | <b>1.33 W/m<sup>2</sup>K</b>                     |
| Air Permeability | 0.6 m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa | 8 m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa | <b>3m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa</b> |

#### 5.4 BRUKL & EPC RESULTS

We have carried out an initial assessment and calculation of the proposed development based on the current Building Regulations Part L documentation that was updated in 2021 and came into effect for new building applications on 15<sup>th</sup> June 2022. The information input to the calculation software is based on the services strategies explained within this report with the following results.

##### Carbon Emissions (kgCO<sub>2</sub>/m<sup>2</sup> per annum)

- Target CO<sub>2</sub> Emission Rate (TER): **18.86**
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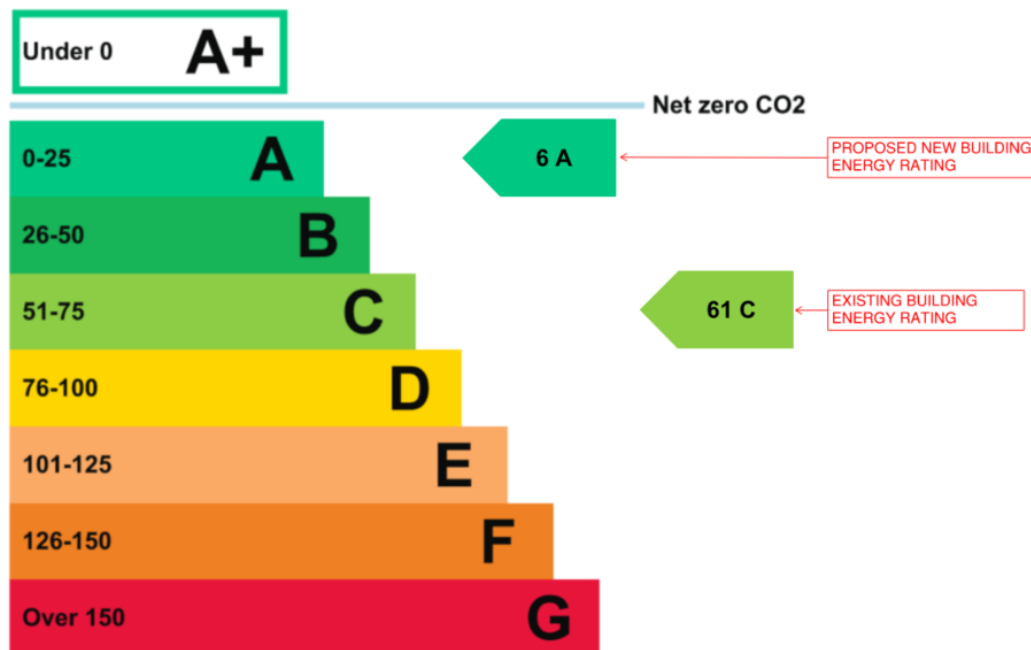
**Our proposals produce 10% less carbon than a modern Building Regulations compliant building and only 21% (almost one fifth) of the existing facility carbon emissions.**

##### Primary Energy (kWh/m<sup>2</sup> per annum)

- Target Primary Energy Rate (TPER): **204.6**
- New Building Primary Energy Rate (BPER): **184.43**

**Our proposals use 10% less energy than a Building Regulations compliant building**

### Energy rating and score



The above graphic identifies a direct comparison of the existing Cascades leisure centre and the proposed new building energy ratings.