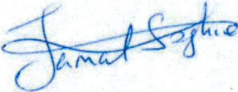
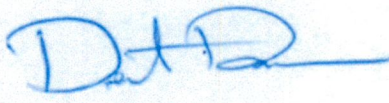




**BUILDING SERVICES & SUSTAINABILITY**  
**REPORT**  
**FOR PROPOSED NEW HOTEL DEVELOPMENT**  
**AT**  
**LIFFEY VALLEY, DUBLIN 22**  
**FOR**  
**WINMAR DEVELOPMENTS**  
**UNLIMITED COMPANY**

**Project No. M3014**  
**Revision 0 – Issued For Planning**

<b>REV</b>	<b>DESCRIPTION</b>	<b>Prepared by</b>	<b>Approved by</b>	<b>Date</b>
<b>0</b>	<b>Issued for Planning</b>	Jamal Saghie	Dermot Doran	<b>14/12/22</b>
Signature				

---

## **SCOPE OF WORKS – MECHANICAL & ELECTRICAL BUILDING SERVICES DESIGN**

- 1.1 GENERAL
- 1.2 SUSTAINABILITY
- 1.3 HEATING AND COOLING SYSTEMS
- 1.4 VENTILATION STRATEGY
- 1.5 ABOVE-GROUND SOIL AND WASTES
- 1.5 RAINWATER HARVESTING
- 1.6 HOT AND COLD WATER SERVICES
- 1.7 FIRE PROTECTION SERVICES
- 1.8 GAS SUPPLY
- 1.9 ENERGY MONITORING
- 1.10 ELECTRICAL (LV) DISTRIBUTION SYSTEM
- 1.11 LIGHTING INSTALLATION
- 1.12 ELECTRIC VEHICLE RECHARGING
- 1.13 GENERAL SERVICES INSTALLATION
- 1.14 PROTECTIVE SERVICES
- 1.15 AUDIO FREQUENCY INDUCTION LOOP SYSTEM
- 1.16 DISABLED REFUGE SSSYTEM
- 1.17 DISABLED TOILET ALARM SYSTEM
- 1.18 ACCESS CONTROL SYSTEM
- 1.19 PHOTO VOLTAIC PANELS
- 1.20 TESTING AND COMMISSIONING

## **BASIS OF MECHANICAL & ELECTRICAL BUILDING SERVICES DESIGN**

### **1.1 GENERAL**

The design of the building services for this new hotel development will have sustainability at its very core. Not only will the development comply with the Building Regulations Technical Guidance Document Part L for Buildings other than Dwellings to deliver a near zero energy building (NZEB) but all aspects of the services will be assessed to include best practice solutions to deliver on the strategy to minimise the carbon footprint and environmental impact of this development.

The hotel accommodation is designed to provide a comfortable and healthy environment for all of its occupants. The design of all building services systems will be centred around the comfort of the end user, with a view to ensuring that they are staying in a comfortable, happy and healthy environment. However controllability will also be central to the design, to ensure that systems are only operational when required and so eliminate unnecessary energy consumption.

The main heating and cooling systems will be selected to utilise the best fit technologies for efficient operation and generation, which will eliminate energy wastage from both the generation and distribution systems.

The heating, cooling and ventilation systems will utilise heat recovery systems to optimise the operational efficiency and minimise energy wastage.

The hotel development will include a wide variety of facilities including:

- Sleeping accommodation
- Restaurant/dining facilities
- Food preparation facilities
- Café and seating areas
- Licensed bar with bar food
- Gymnasium
- Business Centre and meeting room facilities
- Staff areas

The building services systems will be selected, zoned and controlled so as to allow the optimum operation for each type of use because some will be operated on a 24/7 basis and other areas will be used on a scheduled or needs only basis.

The distribution systems will be designed to provide a high degree of flexibility in support of the varied use of the facilities. We foresee that the restaurant, bar and gymnasium facilities may only be open for specific time periods, whilst the main foyer, corridors and hotel rooms will be in constant use and so the services will be capable of supporting both but without compromising on energy efficiency.

Where feasible, natural ventilation will be implemented but due to the nature of the development, it will require a range of mechanical ventilation systems for specific purposes. All ventilation systems will be designed to support the drive for energy efficiency but will also be designed to provide a high degree of control against cross contamination of areas, in order to eliminate nuisance smells and also to provide protection against the indoor spread of virus such as Covid-19.

The control measures will include:

- Suitable filtration of the supply air
- Directional air flows to minimise cross contamination
- Segregation and zoning of ventilation systems
- Odour neutralisation systems to eliminate cooking nuisance smells

The mechanical and electrical plant and systems will be installed and commissioned by manufacturer trained and approved installers to ensure that the maximum efficiency available from the system is delivered.

An energy monitoring system will be installed to provide real time and trended data on the buildings energy consumption, which can be utilised to identify both potential wastage and potential opportunities for improvements.

## **1.2 SUSTAINABILITY**

As well as carbon footprint reduction measures, we will seek to reduce the environmental impact of the development where viable to do so.

The development will be designed with sustainability as core deliverable. The building services systems will be selected and designed to minimise energy consumption, consumption of treated potable water and reduce discharge to the stormwater system from this development.

For example, in conjunction with the green roof designed by the architect, we have included for the collection of rainwater discharge from the roofs into a rain water harvesting tank located in the basement area. We will utilise the collected rainwater to flush the hotels toilets and urinals, for irrigation of the planting and landscaped areas and for wash down facilities in the basement, refuse collection and delivery areas.

In conjunction with the green roof, this will minimise the surface water discharge from the site and simultaneously reduce the consumption of treated potable water to the development.

It is intended to implement a lighting control system to provide a comfortable environment, while optimising opportunities for daylighting, which enhances the wellbeing of the buildings occupants.

Solar shading will be assessed and used where feasible to reduce solar gains but without eliminating daylight and that will in turn reduce the cooling loads for the building.

Space heating, cooling and water heating will be provided by highly efficient air to water heat pump systems which are renewable energy sources and so this building will comfortably meet the requirement of a nZEB building.

## **1.3 HEATING & COOLING SYSTEMS**

The development will be provided with heating and cooling systems to provide comfortable operating temperatures to suit the specific activity in each area.

The heating and cooling generation systems will be selected to meet the following criteria:

- Complies with Part L NZEB requirements
- Realises opportunities for heat recovery
- Provides flexibility for guests and staff in both operation and control
- Easily controlled by guests and staff to meet specific requirements

The system will be designed with a view to both maximising opportunities for using renewable energies and reducing energy wastage. Waste heat recovery will be utilised to serve the development wherever viable, with a view to minimising the annual energy consumption and therefore minimising the operational carbon footprint.

Buildings of this type with multiple facades lend themselves to transfer of excess heat from solar gains to the shaded sides of the building and that will form part of the design strategy.

The system will be designed to provide a high level of flexibility in order to suit the wide range of potential users, without adversely impacting either the controllability or performance of the system.

All the air to water and air to air heat pumps will be located on the roof plant spaces provided where they can operate with high efficiency due to the free airflow, while being invisible to anyone not at a similar height to the hotel roof.

Specific heating/cooling systems to be employed are as follows:

#### **Hotel Bedrooms and Suites**

Each room will be provided with its own fan coil unit or similar, which will be controlled from a wall mounted heating/cooling controller which is accessible to the rooms occupants. We understand that different guests require varied heating and cooling setpoints and so provide a fast acting and easily controlled system.

The FCU will be capable of both heating and cooling and will be connected to a centralised refrigerant system serving the hotel. The system will be designed to facilitate heat recovery so that rooms on the shaded side of the hotel can transfer heat from the rooms on the sunlit side of the hotel, with the former looking for heating and the latter looking for cooling. This minimises the amount of heating or cooling that needs to be generated by the heat pump system and therefore reduces the power consumption. In essence, heat is being moved around the building to where it is needed, as opposed to generating heat or dumping heat.

#### **Restaurant, Bar and Café Facilities**

These areas will be used on a scheduled basis and therefore will not be used at all times. For that reason, the design will include heating and cooling systems which will be dedicated to those facilities.

This will allow for comfortable conditions to be provided for the staff and guests but also facilitate the isolation of those areas when not in use, thereby eliminating any unnecessary energy consumption.

#### **Foyer, Circulation Spaces and Public Toilets**

These areas will operate on a 24/7 basis and with a steady control strategy set from a centralised Building Management System.

Individual systems will be provided to suit the space being served, with an air to air system within the foyer which will have a high ceiling and an air to water system serving the circulation corridors.

The public toilets will be heated to ensure comfort conditions at all times. The heating will be centrally controlled from the BMS.

**Business Centre**

This area will be used by a variety of users and at varied time schedules and so requires tightly zoned and locally controlled systems. Each room or open plan area will be provided with its own locally controlled heating and cooling system. The individual meeting rooms will have a ceiling mounted cassette unit with local wall mounted controller.

All systems will be timeclock controlled to ensure comfort conditions are maintained when required but no unnecessary energy is consumed when facilities are not being utilised.

**Exercise Room**

The exercise room will be open for prescribed times and so will be timeclock controlled from the BMS.

The area will be heated and cooled using a set of ceiling mounted cassette units connected to a dedicated air to air heat pump located on the adjacent roof in the plant space provided, where it is accessible but not visible.

**1.4 VENTILATION STRATEGY**

The ventilation systems provided will be selected to meet the following criteria:

- Complies with Building Regulations TGD Part F requirements
- Suitable air filtration of air flows to eliminate potential for cross contamination
- Implements heat recovery to reduce energy consumption
- Directional air flows to minimise potential for cross contamination
- Pressurisation profile to control transfer of odours from hygiene facilities
- Implements odour neutralisation for cooking facilities
- Provides flexibility for guests in both operation and control
- Provides segregation of air inlets and exhausts to avoid cross contamination

Fresh air will be ducted to each area and distributed to ensure sufficient air change rates for maximum occupancy levels. Exhaust air will be removed and discharged to atmosphere but only after the heat has been recovered to preheat the supply air.

The system will be designed to take advantage of free cooling when available, in order to reduce the running costs and operational carbon footprint.

The development will be zoned so as to allow for a focused approach to suit the wide range of facilities being provided.

The basement carpark is to be mechanically ventilated in compliance with TGD Part F.

The ventilation exhaust openings will be incorporated into the landscaping by the architect so as to be unobtrusive and sensitive to the overall building design.

Specific ventilation systems to be employed are as follows:

**Hotel Bedrooms and Suites**

The bedrooms will be provided with natural ventilation for both background and purge ventilation, via the opening windows.

Each ensuite will be provided with an extract vent which will be connected to a roof mounted extract fan serving a column of rooms.

The make-up air will be brought under the ensuite door from the bedroom, thereby providing a negative pressure in the toilet facilities to retain and remove odours, while also promoting fresh air intake into the room.

**Restaurant, Bar and Café Facilities**

These areas will be provided with mechanical ventilation systems with integrated heat recovery to provide the necessary fresh air, while removing foul air but also minimising the energy required to reheat the supply air. Louvres will be provided at the perimeter of the building at ceiling void level to facilitate supply and exhaust air connections to atmosphere.

This is important because the fresh air requirements for high occupancy areas such as this can be significant energy users. The ventilation systems will be locally controlled to suit the usage schedule.

The commercial kitchen will be provided with dedicated air handling systems. The exhaust will extract air from the central kitchen extract canopy above the cooking appliances and exhaust to atmosphere after suitable odour neutralisation. Fresh air will be provided from a separate and dedicated AHU.

**Foyer and Circulation Spaces**

The foyer is a high volume, low occupancy area and will be provided with fresh air via its air handling unit used to heat the space. It will be monitored and controlled from a centralised Building Management System.

The circulation corridors will be naturally ventilated. The occupancy levels are low and the general movement of people through the area with door and lift movements is sufficient to maintain fresh air levels.

**Public Toilets**

The public toilets will be provided with dedicated toilet extract ventilation systems. The make-up/supply air will be provided from a suitable source which reduces the energy load on the facility.

The extract fans will be centrally controlled and monitored from the BMS.

**Business Centre**

The meeting rooms will be provided with mechanical ventilation heat recovery systems to provide fresh air while recovering the heat from the extracted foul air.

The MVHR units will be located in the ceiling voids and draw the supply air and exhaust the foul air through perimeter louvres located at ceiling void level.

All systems will be timeclock controlled to ensure comfort conditions are maintained when required but no unnecessary energy is consumed when facilities are not being utilised.

**Exercise Room**

The exercise room will be open for prescribed times and so will be timeclock controlled from the BMS.

The area will be ventilated using a mechanical ventilation heat recovery unit located at high level, with supply air inlet and exhaust air discharge through the external wall which is at roof level.

**Basement Carpark**

The two levels of the basement carpark will be mechanically ventilated. The make-up air will be introduced through the open ramp access and extracted to atmosphere at the opposite end of the basement. Each basement level will have a separate system.

The system will comprise of 2 no. extract fans complete with attenuators and backflow dampers which combine to provide both background ventilation and smoke extraction under fire alarm conditions.

The extract fans will operate in conjunction with jet fans to facilitate air movement from the ramp towards the extract fans.

Under standard ventilation conditions, CO<sub>2</sub> sensors which are located throughout the carpark will sense a high CO<sub>2</sub> condition when car fumes have reached sufficient concentration. Any single sensor will then start the ventilation system at background ventilation setting and blow fresh air through the basement to be extracted to atmosphere, until the contamination level drops to an acceptable level, at which time it switches off again. The system operates at a predetermined level to designed flowrates.

This system only operates sporadically as required and will not be required to run for the majority of the time.

Under a fire alarm condition in the basement area, all fans in that level of the carpark will start and operate at full speed to clear smoke from the basement. The system then runs until it fails or else the fire alarm condition is cleared.

**1.4 ABOVE-GROUND SOILS AND WASTES**

An integrated Soils and Waste collection system will be provided to serve the hygiene and plant facilities within the hotel development. The system will comply with TGD Part H and convey the foul and liquid waste directly from the sanitary appliances to the municipal drainage network as efficiently as possible.

The sanitary pipework system will be designed to contain the minimum amount of pipework necessary to carry away discharges from sanitary appliances without risk to health and will prevent air from the drain entering the building under all circumstances.

All pipework materials will be selected to suit the material being conveyed.

All sanitary pipework installations will be tested in accordance with I.S. EN 12056. Inspections and tests will be carried out as the work proceeds, to ensure that all work is free from defects, is sound and unblocked, before building work enclosing it proceeds.

Completed Works will be carefully inspected to see that no foreign matter is lodged or has adhered within the pipes and that no jointing materials projects therein. The system will then be tested for soundness and performance.



## 1.5 RAINWATER HARVESTING

In conjunction with the architect designed green roof on the development, excess clean rainwater will be collected into a purpose designed rainwater harvesting system.

The collected rainwater will be filtered and used to displace the consumption of treated clean mains water, wherever feasible to do so.

The uses for the rainwater may include the following:

- Clean down facilities within the basement and delivery areas
- Irrigation of plants in landscaped areas
- Flushing of toilets

The system will be designed by a specialist consultant to deliver a best practice solution which will minimise the development mains water consumption.

The rainwater harvesting system will be housed within the basement of the building, from where a booster pump will deliver the filtered greywater around the development.

## 1.6 HOT AND COLD WATER SERVICES

A new mains water supply will be extended from the Irish Water network to serve the new development, in full compliance with the Irish Water Guidelines. A dedicated cold water storage tank will be installed in the basement with a dedicated booster pump set to provide a pressurised supply of cold water to the hygiene facilities, where cold water is required.

The main supply will be furnished with an Irish Water meter for monitoring water consumption on site. Landlord submetering will be provided in key locations on the hot and cold water systems to monitor the consumption in specific facilities, in order to help control consumption and identify issues as they arise.

Potable water will be provided direct from the new mains water supply to all drinking water outlets within the restaurant, bar and café, with all necessary control measures to ensure that the quality of the drinking water is maintained.

All pipework and fittings will be CE marked and WRAS approved for the potable water.

The cold water storage system will comply with format 30 standard for storage of potable water and be used to supply the remainder of the hotels facilities. The water supplied to the wash hand basins will be drinking water quality.

A centralised water heating system will be provided to generate and distribute Domestic Hot Water across the development to serve all hygiene facilities using air to water heat pumps. The hot water will be generated in compliance with the TGD Part L and care will be taken to minimise both the storage volume and the heat loss from the system.

A pumped hot water return loop will be provided to ensure hot water is readily available at all outlets and avoid unnecessary running of taps. The hot water system will be thermally insulated to minimise heat loss from the system and both

Hot water temperature will be controlled at the hot water outlets in the development with Thermostatic Mixing Valve to TMV3 standard and temperatures will be set at 43°C.

Low flow devices will be utilised on all appropriate outlets to minimise water consumption and subsequent foul drainage discharge.

The entire hot and cold water services installation will comply with Building Regulations, manufacturer's requirements, the National Guidelines for the Control of Legionellosis in Ireland (2009) and CIBSE Guide TM13 "Minimising the risk of Legionnaires' Disease".

## **1.7 FIRE PROTECTION SERVICES**

The new development will be provided with all fire detection and protection measures stipulated in the Fire certificate.

Measures will include the following:

- A fully integrated fire detection system to alert occupants and allow safe evacuation of the premises
- Portable fire fighting equipment
- Disabled refuge system
- Fixed fire fighting systems, ie. dry risers in service cores
- Fire fighters lift

In case it is required by the Fire Safety Certificate, we have allowed for the installation of an automatic sprinkler fire fighting system being installed. The firewater storage tank will be located in the basement, along with the fire pump set and all associated test valves will be suitable located in accessible locations.

All mechanical and electrical services will be designed to minimise penetrations of fire compartments but where necessary, the penetration's will be engineered to maintain the integrity of the fire compartmentation.

## **1.8 GAS SUPPLY**

We have provided for a gas supply to serve the cooking appliances in the kitchen serving the restaurant. The gas meter will be located adjacent to the kitchen in the delivery area, with the gas distribution within the ventilated basement space beneath the kitchen.

## **1.9 ENERGY MONITORING SYSTEM**

Energy metering will be provided on all primary energy sources to facilitate monitoring of usage with a view to ensuring efficient use of systems.

Submetering will be installed where appropriate to gather consumption data for analysis by the client.

Systems metered will include the following:

- Electrical power
- Gas (if required)
- Mains water

Although the data will be accessible to the hotel management, the system will be capable of being connected to an energy monitoring system with remote access for evaluation of energy consumption over time by third party experts, if ever required. This information can be used to modify approaches to energy use.

## 1.10 ELECTRICAL (LV) DISTRIBUTION SYSTEM

ESB Networks will provide 10KV supply to the development and the supply will be metered at 10KV.

A client 10KV/400V substation will be provided and located adjacent to the ESB Substation.

The client substation shall provide LV Supply for the development. Mains 600V/1000V Cables laid in ground will enter the development at basement -1 level and terminate in the Main Switchboard located in the switchroom located at basement -1.

### ELECTRICAL DISTRIBUTION SEQUENCE

The main incoming supply shall terminate in the new main switchboard located in basement -1.

From the main switchboard, sub-mains cables shall run to:

1. Sub-distribution board to provide for floors 1 to 6.
2. Motor Control Centres
3. Distribution board within ground floor foyer.
4. Distribution Board within the Restaurant/Kitchen
5. Distribution Board within the Bar
6. Distribution Board within the Business Centre
7. Lifts

From each floor sub-distribution, sub-mains cable shall run to:

1. Each bedroom Consumer Unit within the block.
2. Landlord's distribution board within the secondary distribution electrical switchroom/cupboard.

All Submains Cabling shall be in XLPE/LSHF/SWA/LSHF & Earth run on Cable Tray.

All cables to be rated Class Dca, s1b, d2, a2 in accordance with EN50575 and IS10101:2020 clause 527.

Surge protection for the power supply system shall be provided in accordance with IS EN 62305, IEC 61643-12, IEC 60364-5-53 and IS10101:2020+AC1:2020

Surge protection devices will be provided for the main distribution board, sub-distribution boards and to the incoming fibre optic cabling, telecoms cables to protect all essential equipment.

Energy saving switch will be provided in each bedroom/suite to switch off the power to the bedroom/suite in the event that the bedroom is vacant.

An electric generator installation will be provided to provide standby power to Life Safety Systems and some other systems deemed critical, upon failure of the ESB Supply.

Generally, the generator will serve the Basement Carpark Smoke Ventilation System, the Firefighter's Lift and its associated services, Sprinkler System pumps, Water Services pumps, etc.

The generator room is to be located at Basement level -1. The Generator Flue will be routed to a safe location away from the building.

Supply air will be provided to the Generator Room through external louvres at the carpark entrance ramp.

### 1.11 LIGHTING INSTALLATION

The new lighting installation throughout the development will be provided by means of energy efficient LED lighting in compliance with TGD Part L Buildings other than Dwellings.

Daylighting and automatic lighting controls will be provided throughout the development to eliminate unnecessary artificial lighting in order to minimise energy usage. Lighting controls in the development will follow the guidance in BRE Digest 498: Selecting Lighting Controls.

The area of openings provided (internal atrium) in the development should take account of the level of daylight provision appropriate to the building. The lighting design will follow BS8206-2:2008 Lighting for Buildings, CIBSE Lighting Guide (LG10) Daylight, CIBSE Lighting Guide (LG09) and CIBSE Lighting Guide (LG7). As part of the lighting design, natural daylight will be optimised where practical, taking into account the advice of BS8206 and LG10.

The aim of lighting controls will be to encourage the maximum use of daylight and to avoid unnecessary artificial lighting, particularly when spaces are unoccupied, while having regard to the need to ensure that the operation of automatically switched lighting systems does not endanger occupants in a building.

Light switches will be located at heights in accordance with TGD Part M,

Self-contained emergency luminaires, Exit Signs and self-contained battery packs fitted to general luminaires shall be provided throughout the Building, as necessary, in accordance with Irish Standard IS 3217:2013 +A1:2017, I.S. EN 1838: 2013 (Lighting Applications – Emergency Lighting), I.S. EN 50172: 2004 (Emergency Escape Lighting Systems), I.S. EN 62034:2012 (A.T.S Emergency Lighting) and HAS – Safety Signs Directive 1995 and the requirements of the Fire Officer. Exit signage to comply with IS EN 60598-2:22 and sign type To BS ISO 3864 Part 1:2011 & ISO 7010:2011.

### 1.12 ELECTRIC VEHICLE RECHARGING

An electric vehicle recharging installation will be provided as part of the development and located within the 2 No. levels of the basement. The EV recharging system will comply with the TGD Part L Buildings other than Dwellings and EU Directive 2014/94/EU.

The EV recharging points will be installed in accordance with the general wiring rules and safety requirements as outlined in the National Rules for Electrical Installations I.S. 10101:2020.

The ducting infrastructure within the 2 No. carparks is to be adequately designed to meet the full capacity of all recharging points when installed.

### **1.13 GENERAL SERVICES INSTALLATION**

The development will be provided with an integrated wiring system distributed vertically within the services risers and horizontally within the ceiling voids throughout the hotel.

Distribution boards and sub-distributions boards will be provided to minimise the number of installed cables and maximise the distribution efficiency of the system.

They will be located to provide easy access for maintenance and quick resolution of issues, while also providing access controls to prevent interference from unauthorised personnel.

Each pair of bedrooms will be provided with a dedicated sub-distribution board located within the service void accessible from the main corridor.

All socket outlets shall have outboard rockers, with neon indication. The rocker colour, switch plate cover shall have contrasting colour and switches should be adequately separated to allow selection of one at a time and avoid the unintended selection of adjacent switches to ensure compliance with TGD Part M of the building regulations.

### **1.14 PROTECTIVE SERVICES**

The development will be provided with a fully addressable type L1 fire detection and alarm system serving all areas of the development in accordance IS3218:2013+A1:2019. The main fire alarm panel will be located within the hotel management suite with local fire alarm panels at all necessary locations. All components will be installed to be readily accessible for maintenance.

The development will also be provided with an Intruder Alarm system to prevent unauthorised access to critical areas and prevent unauthorised opening of dedicated fire escape doors.

CCTV cameras will be provided to monitor entry and exit locations, such as the carpark and Delivery Yard, as well as other areas deemed critical security zones.

### **1.15 AUDIO FREQUENCY INDUCTION LOOP SYSTEM**

An Audio frequency induction loop system will be provided for the reception desk in compliance with TGD- Part M and shall be installed and commissioned in accordance with EN 60118-4.

### **1.16 DISABLED REFUGE SYSTEM**

A disabled refuge system will be provided throughout the building.

The system will provide secure two-way Duplex voice communication between each of the refuge points at each floor level and the master station located on the ground floor. The system is to comply with the requirements of BS 5839 Part 9: 2011.

Each communication station shall be linked to its master station/stations by means of fire-resistant cables.

The disabled refuge panel will be located adjacent to the fire alarm panel.

### **1.17 DISABLED TOILET ALARM SYSTEM**

A disabled toilet alarm system will be provided for all accessible toilets in accordance with BS8300:2009

The systems will consist of a pull cord unit with reassurance lamp, illuminated reset unit, tone generator with lamp. Main panels shall be wall mounted panel (flush) c/w power supply and battery backup. Water resistant reset units c/w magnetic reset key shall be installed within the shower facilities and associated areas as indicated. Disabled toilet alarm panel will be located at reception

### **1.18 ACCESS CONTROL SYSTEM**

A dedicated access control system will be installed to allow the hotel management authorise guest access to specific areas and rooms. Each hotel room door will be provided with a unique identifier so that any one door or group of doors can be accessed from an authorised card.

### **1.19 PHOTO VOLTAIC PANELS**

Provision will be made for PV installations on the flat roof sections of the development. The PV installations will be integrated within the green sedum roof, with suitable maintenance access provided.

The PV panels will be orientated to maximise their efficiency, which will be excellent due to the unobstructed roof space available.

The electricity generated will be utilised for the hotels permanent systems which operate 24/7 and all power generated will be 100% utilised.

### **1.20 TESTING AND COMMISSIONING**

All mechanical and electrical building services will be commissioned and tested by specialists in accordance with the relevant Specifications, Guides and Commissioning Codes of Practice. This will ensure that each system is operating to its optimum level of efficiency.

Systems which will be commissioned include the following:

- Heating and cooling generation and distribution systems
- Domestic hot water generation and distribution systems
- Cold water distribution system
- Ventilation systems
- Energy monitoring systems
- Electrical distribution systems
- Lighting control systems
- Emergency lighting
- IT systems
- Fire detection system
- Access control system
- Intruder alarm system
- CCTV system