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Consulting Engineers - Building Services

Mechanical and Electrical Services Technical Report – Stage 2 (Part - V111)

Living Georgian Housing Project

33/34 Thomas Street, Co. Limerick

December 2022

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1.0 Introduction

The purpose of this report is to outline the mechanical and electrical services engineering design strategies for the proposed Living Georgian Housing Developments at 33/34 Thomas Street Co. Limerick.

The Development scheme will consist of 13 number units, Commercial and community space and landlord areas at 33/34 Thomas Street.

The strategy for the design of the mechanical and electrical services is to provide a safe, robust and energy efficient environment for the occupants while maintaining the necessary environmental conditions for the different types of rooms. The report is principally based around strategy descriptions, explaining principles as necessary.

1.1 Assumptions

Design Development

The proposals based in this report are based upon the latest information available at the time of producing this report and are therefore subject to change in line with client/project design development.

1.2 General

The building services will be designed to:

- Provide all materials and works following the appropriate design standards.
- Ensure all equipment and systems are designed and installed under the relevant standards and that operational compatibility exists between the systems and any other system installed at the same location.
- Supply plant and equipment to achieve the specified design conditions and to provide stable control.
- Comply with the requirements of the Building Regulations, Technical Guidance Documents and Best practices in the Building Services Engineering Services Design.

1.3 Design Standards

The following Codes, Standards and Regulations where relevant shall apply:

- Building Regulations TGD's:
 - Part B – Fire Safety
 - Part F – Ventilation
 - Part L – Conservation of Fuel and Energy (Latest Edition)
 - Part G – Hygiene
 - Part H – Drainage and Wastewater Disposal
 - Part J – Heat Producing Appliances
 - Part M – Access and Use
- IS 10101: 2020 - National Rules for Electrical Installations.
- Health and Safety:
 - Health and Safety Act 2005
 - Health and Safety and Welfare at Work (Construction) Regulations 2013
 - Health: Safety and Welfare at Work General Applications 2005
- CIBSE Design Guide A: Environmental Design
- CIBSE Design Guide B: Heating, Ventilation, Air Conditioning and Refrigeration
- CIBSE Design Guide C: Reference Data
- CIBSE Design Guide E: Fire Engineering
- CIBSE Design Guide F: Energy Efficiency
- CIBSE Design Guide G: Public Health Engineering
- CIBSE Design Guide H: Building Control Systems
- CIBSE Design Guide L: Sustainability
- CIBSE Design Guide M: Maintenance Engineering
- Heating and Ventilation Contractors Association (HVCA) Technical Guidance Documents
- BS 8558: 2011 Guide to the Design, Installation, Testing and Maintenance of Services Supplying Water for Domestic Use Within Buildings and Their Curtilages
- BS EN 806: Specification for Installations Inside Buildings Conveying Water for Human Consumption.
- Requirements of the Local Fire Authority
- CIBSE code for Domestic Heating Installations
- The Institute of Plumbing Guide

- Sustainable Energy Authority of Ireland (SEAI) Guidance Documents
- IS 291: 2015: Selection commissioning, Installation, Inspection and Maintenance of Portable Fire Extinguishers
- CE Marking of all equipment
- All Relevant European Directive and Harmonised Standards
- European Union (Energy Efficiency) Regulations 2014
- SEAI Triple E Register of Products
- CIBSE Technical Manual TM13: 2013 Minimising the Risk of Legionnaires Disease
- Recognised Best Industry Standards and Practice

2.0 Sustainable Design Measures

- The new apartment units in this development will be aiming for high airtight construction (airtightness value of $3.0\text{m}^3/\text{h}/\text{m}^2$ @50 Pa will be targeted) and high-performance building fabrics to comply with the Part L requirement and it will reduce the heat loss through the new buildings. The targeted minimum building energy rating (BER) is A3 for the new building.
- To mitigate the use of fossil fuels and achieve the National and European targets for carbon emissions this development will be utilising high efficiency air to water heat pump technology for space heating and domestic hot water generation.
- Under the current circumstances of COVID-19 and advice from the various professional bodies the requirement of very good indoor air quality in dwellings has been explored and the need for Mechanical Ventilation with Heat Recovery (MVHR) for all habitable areas in the apartments are proposed.
- The LED lighting system shall comprise daylight/movement PIR's and Retractable/dimming switches. This will save on electrical energy costs.
- The location of Solar PV Panels has been envisaged at this stage to be installed on the roof of the new build development to power the part electrical load of the apartments.



Figure 1 – Typical MVHR



Figure 2 – Typical Solar PV panels



Figure 3 – Typical Heat pumps

3.0 Mechanical Services

The engineering services design approach will focus on a number of key design goals. These have been identified and summarised below. These design goals will be used during the design development in order to provide a building that can:

- Meet the current and future functional needs of the building and its occupants
- Offer a high-quality internal environment
- Be safe and secure
- Be flexible in its usage and operation
- Make creative and maximum use of natural light
- Minimise energy usage
- Maximise use of passive environmental control (daylight, natural ventilation, good thermal insulation etc.)
- Minimise maintenance requirements and costs
- Offer value for money

The design of the engineering services will be in accordance with the client brief and associated codes of practice and building regulations.

3.1 Foul Above Ground Drainage

- The new development will be provided with a new ventilated soil and waste pipe above ground drainage system installed to receive waste discharges from WC's, basins, sinks, and equipment where applicable. The above ground drainage from the development will connect into a new below ground drainage network.
- The above ground drainage pipework will be in a suitable plastic pipework system with acoustic properties as required to connect to the below ground drainage system.

3.2 Domestic Cold-Water Services

- A separate new mains water connection will be taken to the entry of both developments.
- A test point shall be provided on the incoming mains water supplies to allow samples of water quality to be taken.

- Each apartment to have a separate cold water storage tank with integrated booster pump from which all the cold-water outlets in the apartments are fed.



Figure 4 - Typical example of a cold-water storage tank in the apartment with booster pump

- Each unit will be supplied with a metered mains water service from the local authority water mains. Mains water will run to serve potable water outlets, drinking water points, sinks, heating plant and water storage tanks. Connections to any mechanical plant and external taps will be provided with adequate backflow protection terminated with an isolating valve.
- Tanks shall be WRAS approved and of the following storage capacity: 1 to 2 Bedroom Units: 250 liters.

3.3 Domestic Hot Water Service

- The domestic hot water in each apartment is generated by the air source heat pump located externally and stored in the indoor storage unit to be placed in the storage cupboards.
- The hot and cold-water services installation shall be carried out in accordance with the requirements of TGD Part G, TGD Part L, CIBSE Guide G, HVCA Guide TR20 Parts 4 and 5, the Institute of Plumbing, BS 8558: 2011 and BS EN 806.
- All hot water outlets will have lockable and adjustable thermostatic mixing valves installed as near to the source of draw off points to minimise the risk of Legionella. All wash basins generally will have the thermostatic mixing valves set originally at 41°C for reasons of health and safety.

3.4 Low Temperature Hot Water Heating

- Low temperature hot water heating will be provided to each apartment unit via, air source heat pump (ASHP) system.
- The main space heating strategy in the commercial units and communal spaces shall be via smart electric panel radiators with the ability to store 7-day schedules for setback temperatures for space heating.
- The space heating installations shall comply with TGD-Part L, SEAI Guidance Documents, CIBSE Guide for Domestic Heating Systems and CIBSE Guides A and B.
- The outdoor unit shall be located external to the units (Please refer to Appendix 1 for location of all outdoor heat pump plant) been served in a suitable location as identified as follows:

33/34 Thomas Street

Units 1, 2, 3, 4, 6, 7, 9, 10, & 12 – External units located at roof level.

Units 5, 8, 11, 13 & Community space – External units located at roof level.

- The system shall have no more than 10% capacity reduction between air temperatures of +7°C and -7°C with no requirement for supplementary heating.
- The main controller will have the ability to store 7-day schedules for domestic hot water and set back temperatures for space heating. The controller shall be used for commissioning the system by the contractor.
- All external pipe work shall be insulated to ensure minimal thermal heat loss and maximum weather protection using high density weather resistant pipe insulation.
- Underground pipework shall be of a pre-insulated rigid plastic type. All external fittings, components and pipework shall be insulated.

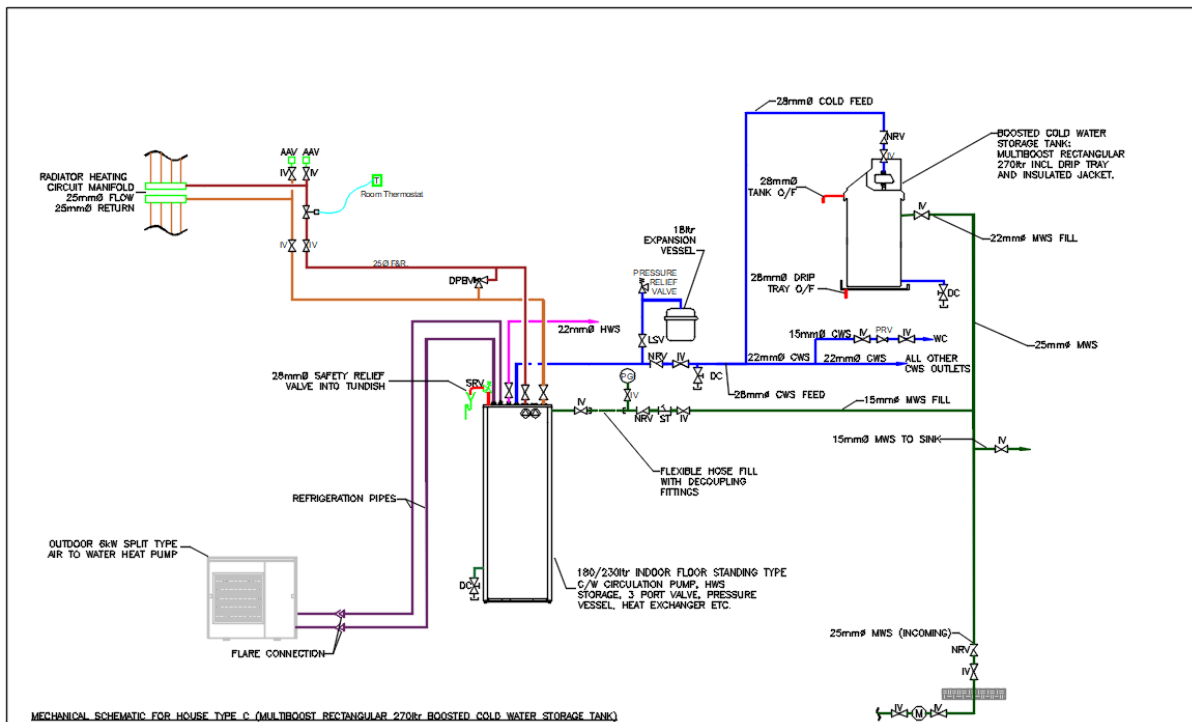


Figure 5 - Typical Air Source Heat Pump Schematic.

3.5 Ventilation

- The Mechanical Ventilation with Heat Recovery (MVHR) will cater for the ventilation requirements and conform to the requirements required by NZEB in terms of energy and cost efficiency in all apartments.
- The proposed MVHR will be a fully ducted system type.
- The air is extracted from the wet areas and make up fresh air is drawn from outside and the heat from extracted air is recovered using high efficiency plate heat exchanger to condition the fresh air which is supplied into bedroom and living/dining rooms.

3.6 Space Heating

- It is proposed to provide a high efficiency air source heat pump in each apartment as noted in section 3.4 above, this system will meet Part L compliance of the building regulations.
- LST Radiators shall be the main heat emitter type in these apartments.
- The main space heating strategy in the commercial units and communal spaces shall be via smart electric panel radiators with the ability to store 7-day schedules for setback temperatures for space heating.

- The space heating installations shall include all heating distribution pipework, heat emitters/radiators, heating controls and circulation pumps.
- The pipework shall comply with BS7291-1 and BS5955-8 and the installation shall comply with HVCA Specification TR20-1, CIBSE Guide for Domestic Heating Systems and recognized best practice.
- Piping buried in floor screeds, concealed in partitions and suspended timber floors and all other concealed locations shall be insulated.



Figure 6 - Typical Radiators

3.8 Protective Services

- Protective services to the apartments against the risk of fire shall be by means of handheld fire extinguishers and fire blankets.
- Fire extinguishers will be strategically positioned in kitchens and will be in the form of dry power, foam and carbon dioxide and will be sized to current standards typically 6 litre powder and 2kg CO₂.

4 Electrical Services

4.1 Electrical Site Services

- 33/34 Infrastructure will utilize the existing ESB Mini pillar located on wall between 33 and 34 Thomas Street. New underground ESB ducts from this mini pillar(2 number 125mm Ducts) will then terminate in dedicated ESB metering room located off new main access area into courtyard space. This ESB room which will house the main ESB meters for each unit and landlord/commercial areas will be ducted underground to bring electrical supplies to each unit electrical consumer unit.



Figure 7 – Existing ESB Mini pillar between 33/34 Thomas Street

- New Eir supply to taken from the existing underground duct services located on Thomas Street and terminate in new ground level services room will in turn will serve the communication requirements of each unit.

4.2 Electrical Supply and Mains Distribution

- A metered single phase 63 Amp, 230 Volt power supply will be connected to a central consumer unit. The consumer unit will generally be located near main entrance lobby/hall of each unit.
- All new electrical installations will comply with the new IS 10101 which is now in place and replaces ETCI 2008 Wiring document. For this development this will include additional safety devices i.e., Arc fault detection devices (AFDDs), in the electrical consumer units resulting in larger consumer units within each apartment.

4.3 General Power Services

- General services to be provided include power sockets, television outlets, telephone outlet and electric cooker outlet. All units will be wired for a security alarm system.
- A solar photovoltaic combination system shall be provided to meet renewable energy requirements for Part L of the building regulations
- All systems shall be complete with internal solar heat exchanger box. Contractor will also include from supplier the solar flash system for securing panels to roof.

4.4 Lighting Services

- Energy efficient lighting will be provided throughout each residential unit and all lighting will be switched locally. An external LED site lighting scheme will be incorporated around enclosed courtyard area for security and access purposes. The site lighting will be controlled via a public lighting pillar located near the ESB mini pillars.

4.5 Protection – Fire Alarm

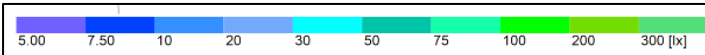
- The fire alarm installation shall be Category L1D and shall comply with the requirements of IS 3218: 2017. The system shall be mains operated with battery backup and shall be wired in PH 120 fire resistant cable. All devices shall be on the same circuit and connected together. All shall sound in the event of detection. A rate of rise type heat detector shall be provided in the kitchen. The power supply to the circuit shall be via an independent 6 AMP MCB at the main consumer unit. All devices shall comply with EN 54-13. A CO (carbon monoxide) detector shall be provided in the kitchen area as indicated on the drawing.

4.6 Energy Efficiency and Sustainability

- The Apartment units will be constructed to achieve high performance in terms of thermal insulation and low energy usage. The energy target will be 50kWh/75kWh/m²/annum for each house which is equivalent to an A3 energy rating. High levels of fabric insulation including high performance glazing systems will be integrated in the overall design along with a good level of air tightness (3.5 to 5.0 m³/hr/m²/annum).

4.7 Site Lighting Report



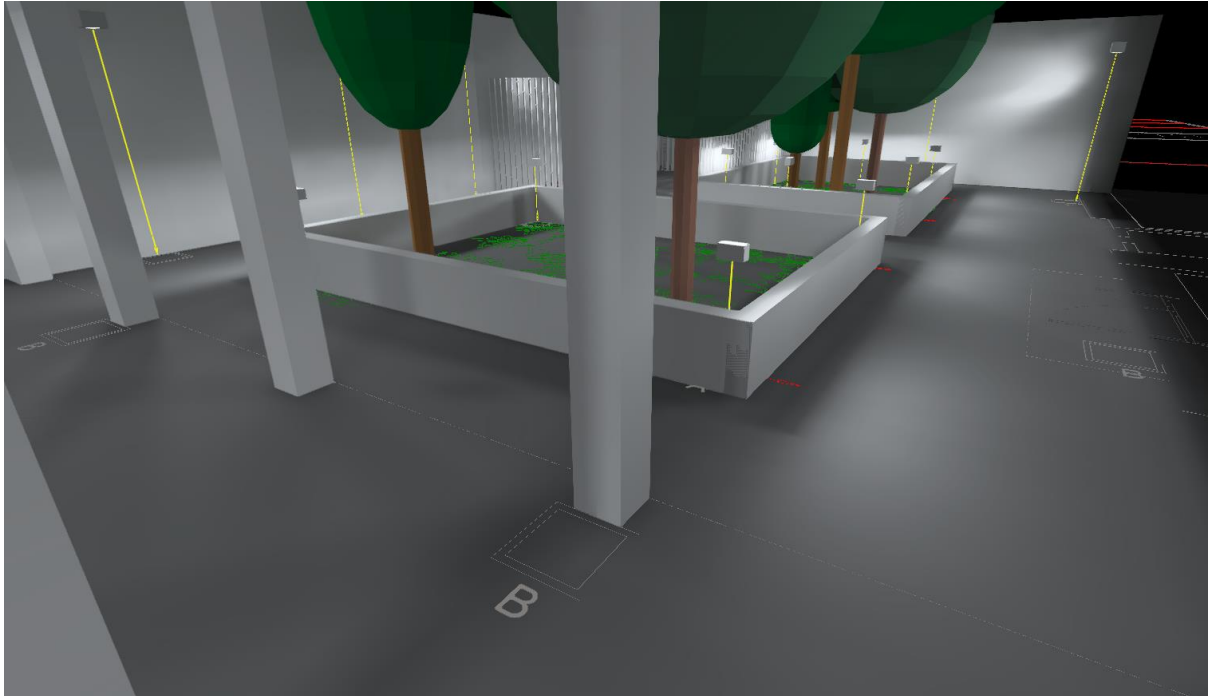
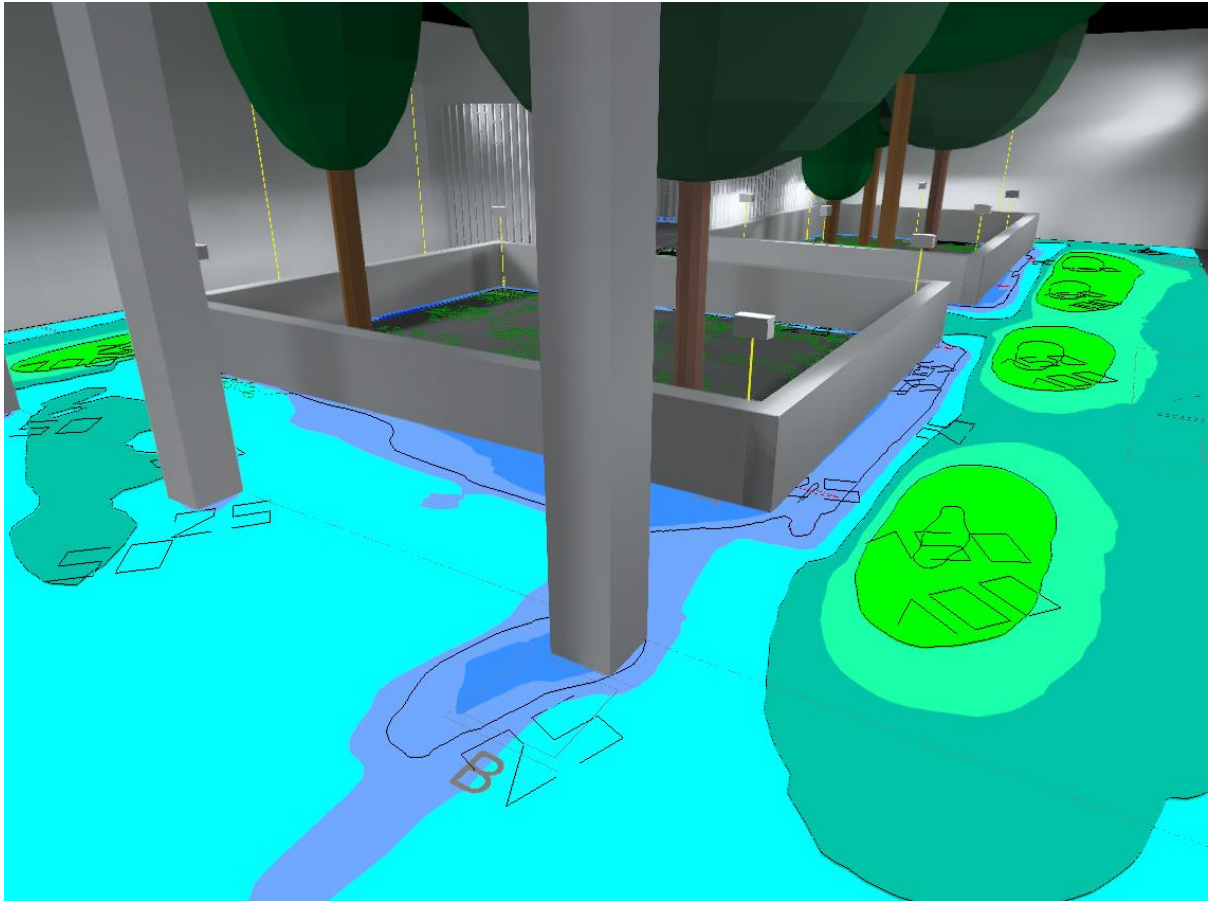


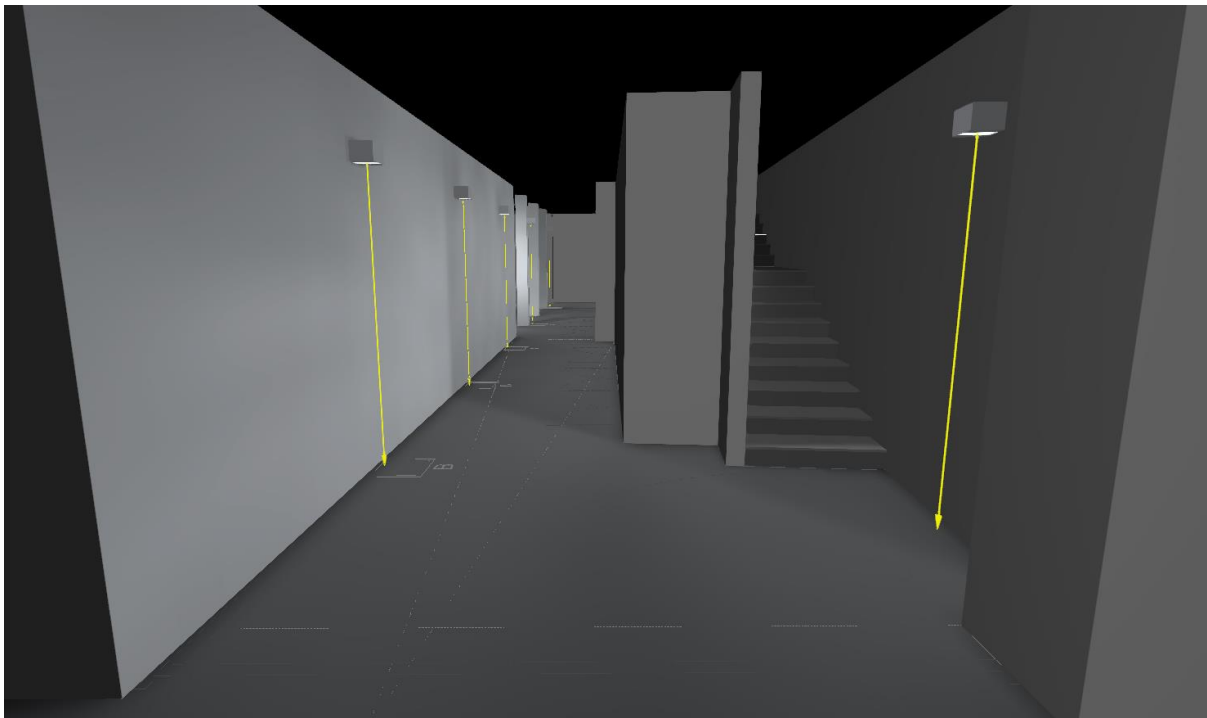
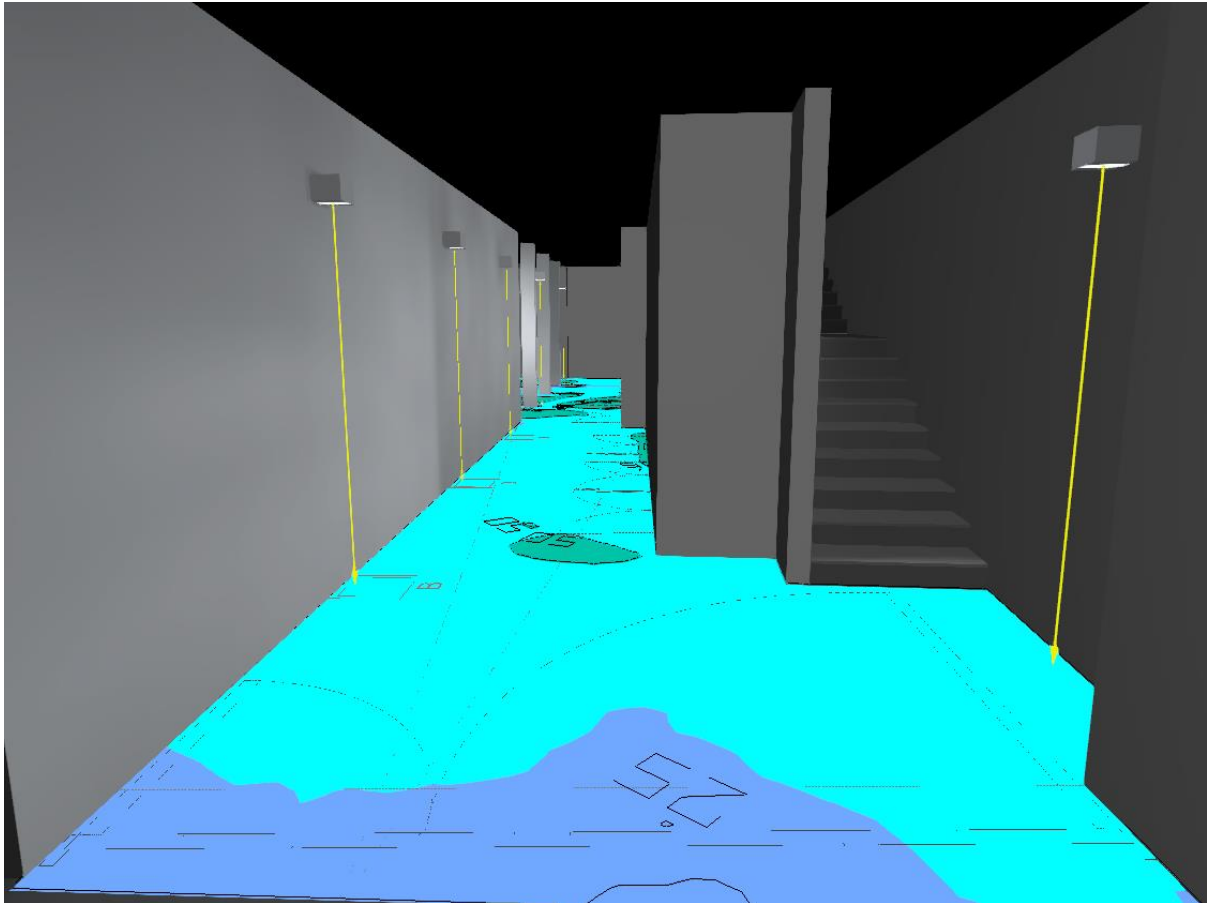
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Maintenance factor	0.80 (fixed)	Height Working plane	0.000 m
		Wall zone Working plane	0.000 m

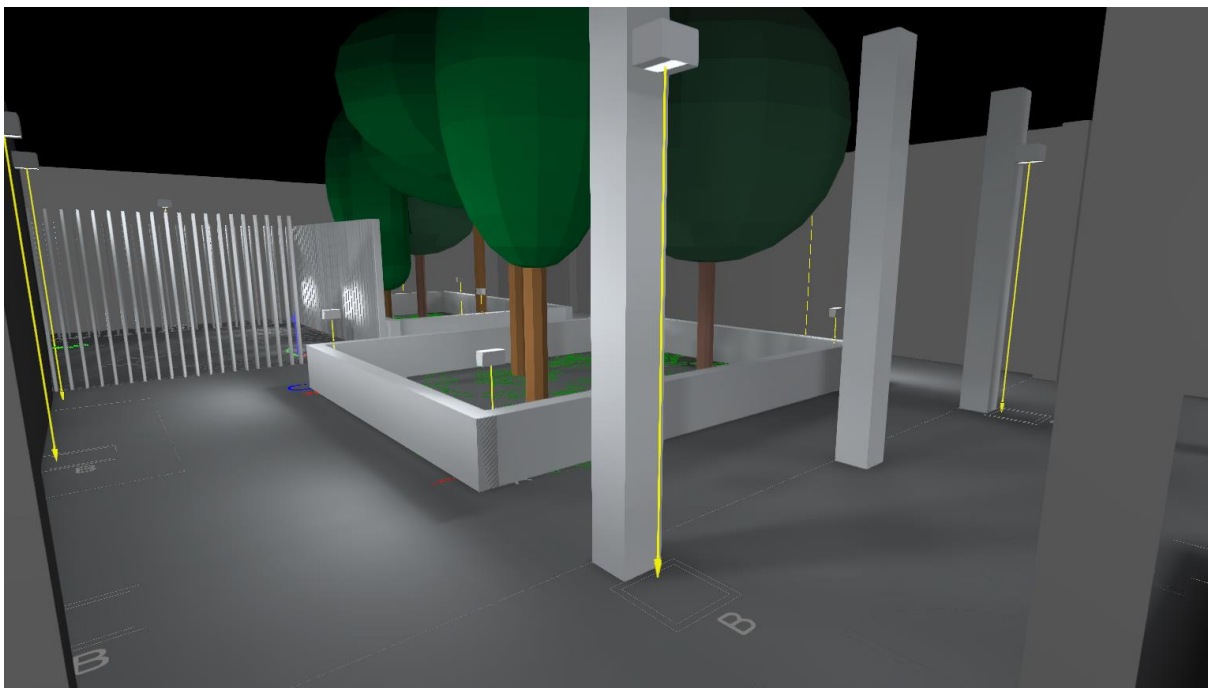
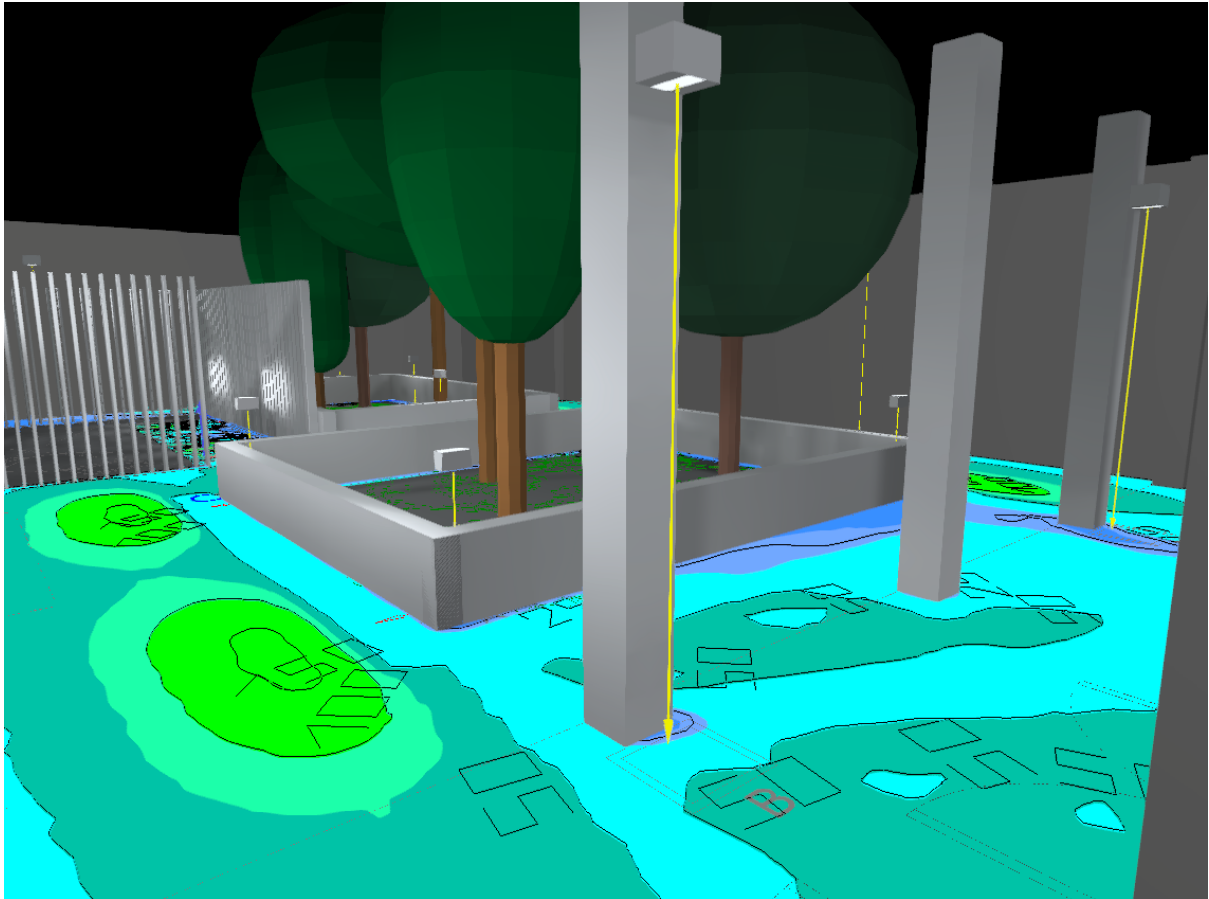
Results					
	Symbol	Calculated	Target	Check	Index
Working plane	$\bar{E}_{\text{perpendicular}}$	53.0 lx	≥ 5.00 lx	✓	WP1
	g_1	0.14	≥ 0.11	✓	WP1
Energy estimation⁽²⁾	Consumption	2497 kWh/a	max. 5000 kWh/a	✓	
Room	Lighting power density	2.01 W/m ²	-		
		3.80 W/m ² /100 lx	-		

(1) Based on a rectangular space of 20.261 m x 18.351 m and SHR of 0.25.
(2) Calculated using DIN:18599-4.

Utilisation profile: General circulation areas at outdoor workplaces (5.1.1 Walkways exclusively for pedestrians)



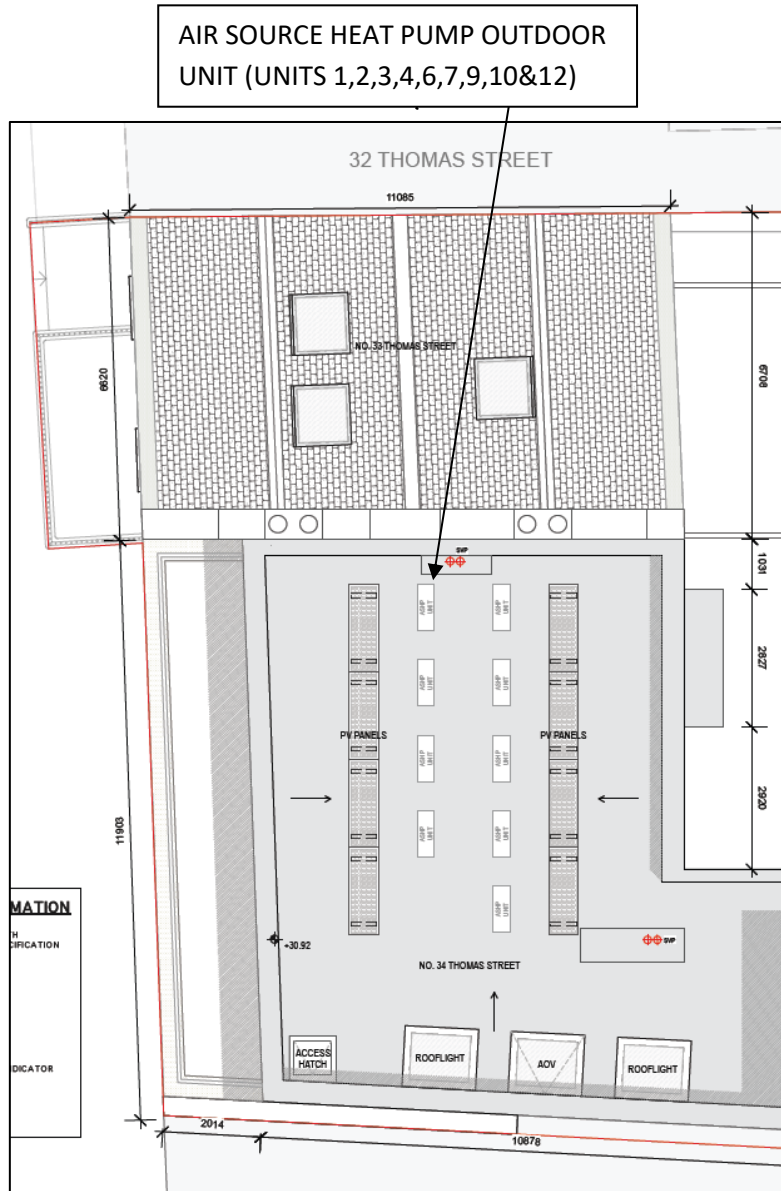




Appendix 1 – External Air source Heat Pump Locations

33/34 Thomas Street

Units 1,2,3,4,6,7,9,10,&12



Units 5,8,11,13 & Community Space

