

ACBA5019 – Construction Technology 2

Assignment:

New Hotel Proposal Report

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Executive Summary

This report looks at options for building a medium- to high-rise hotel in Swansea. It compares choices for the structural frame, foundations, external walls / Envelop, and how to build (prefabrication vs on-site). Swansea is a coastal and windy city with high rainfall. The ground can also be variable, so foundations need to deal with that. The report recommends a reinforced concrete frame with a concrete core for stability and fire safety, bored piles for foundations, and a hybrid façade: brick/stone at the lower levels and non-combustible rainscreen cladding above, with curtain wall glazing at feature areas. It also recommends prefabricated bathroom pods, prefabricated MEP risers, and unitised/panelised façade to speed up construction and improve quality. Choices consider strength, stability, fire safety, looks, maintenance, cost, and sustainability.

Introduction

The client has approached us with plans to build a new hotel at the junction of Sketty Lane and Mumbles Road, near Singleton Hospital in Swansea. The hotel will be medium to high-rise, which means it needs a strong and stable structure, safe design, and materials that can cope with local conditions. The client is inexperienced in construction, so this report explains the main options in clear terms and recommends the best solutions.

The report will focus on three key areas:

- Structural frame and foundations – what type of frame and foundation will safely support the building on Swansea’s ground conditions.
- Building envelope – what materials and construction methods will protect the building from the weather, meet fire and energy standards, and look attractive.
- Prefabrication or on-site construction – which parts of the building can be made off-site to save time, improve quality, and reduce waste.

The design must consider strength, stability, fire safety, aesthetics, and sustainability. Swansea’s coastal location means the building will face strong winds, heavy rain, and salty air, so materials must resist corrosion and weathering. The ground near Sketty Lane and Mumbles Road may include made ground and clay, so foundations need to cope with this. The hotel also needs to meet Welsh Building Regulations and provide a safe and comfortable environment for guests.

This report will compare different options for each element and explain why the recommended choice is best for this project. It will also show how the design can reduce environmental impact and support sustainability goals. Sketches and diagrams will be included to help the client understand the ideas clearly.

Proposed Construction Site

Aerial View: [Untitled map - Google Earth](#)



View from Mumbles Road: [Mumbles Rd - Google Maps](#)



View from Sketty Lane: [A4216 - Google Maps](#)



Site Context & Environmental Factors

The proposed hotel site is at the junction of Sketty Lane and Mumbles Road, near Singleton Hospital in Swansea. This is a coastal location with exposure to strong winds, heavy rainfall, and salt-laden air from Swansea Bay. These conditions can cause corrosion of metals and increase the risk of driving rain penetration into the building envelope. The design must use durable materials and include good detailing to resist these effects, such as marine-grade finishes and robust drainage systems.

Ground Conditions

Borehole records from the Swansea coastal corridor, including BGS SS69SW28 and SS69SW117, show a consistent geological pattern that matches findings from nearby investigations at Singleton Hospital and Sketty Lane.

Ground Conditions

Made Ground 0–1/1.5 m

Mixed fill (slag, ash, gravel, construction debris). Highly variable and unsuitable for structural loads.

Clay ~1–6 m

Soft–firm to stiff sandy silty clay with occasional gravel/cobbles. These soils have limited bearing capacity and can settle under heavy loads.

Dense Sand and Gravel ~6–10+ m

Very dense granular deposits with cobbles/boulders, offering strong bearing capacity. BH8 shows high SPT resistance and partial refusal, confirming the strength of deeper strata.

Groundwater: Shallow (1–2 m)

Overnight inflow in BH8 and previous local studies indicate permeable gravels and water sensitive excavation conditions.

Implications for Hotel Construction

Shallow foundations would be unsuitable due to weak nature / makeup of the Made Ground and settlement prone clays. Piled foundations are normally required for medium to high rise structures and buildings in this area, transferring loads into the dense sand and gravel layers below. Excavation and below ground works may require dewatering and temporary support due to permeable gravels and shallow groundwater.

Recommendation based on Bore hole information

The site is suitable for hotel development provided that foundations bypass the upper weak soils. Pile foundations likely Continuous Flight Auger piling or bored piles would be the appropriate solution to achieve stability and minimise settlement risks.

Other Site Factors

The site is close to a busy road and Singleton Hospital, so construction noise and vibration should be kept low to avoid disruption. This makes bored piles more suitable than driven piles, as they produce less vibration. The building should also provide good acoustic insulation for guest comfort, as traffic noise from Mumbles Road can be significant.

At street level, the design should fit the character and style of the local area, using materials like brick or stone for the podium to match nearby buildings. Upper floors can use lighter cladding systems to reduce weight and speed up construction.

Structural Frame & Foundations

The recommended structural system for the proposed hotel is a reinforced concrete frame with a central reinforced concrete core, chosen for its strength, fire resistance, and ability to provide lateral stability against strong coastal winds and storm conditions common in Swansea. The reinforced concrete core acts as the main stabilising element, resisting wind loads and ensuring the building remains safe during adverse weather events. Concrete also offers good acoustic performance, which is important for guest comfort near busy roads. However, reinforced concrete construction can be affected by heavy rainfall and low temperatures, so careful planning and the use of jump-form systems for cores and table forms for slabs will help maintain progress during poor weather.

The reinforced concrete frame will impose substantial loads on the new hotel foundations, requiring a design that reflects the variable ground conditions at the junction of Sketty Lane and Mumbles Road. Borehole evidence from the Swansea coastal corridor, including BGS records SS69SW28 and SS69SW117, shows a consistent profile of Made Ground in the upper 0–1.5 m, underlain by soft to firm, locally stiff clay soils extending to around 5–6 m, and dense sand and gravel strata at deeper levels (typically 6–10+ m). Groundwater is commonly encountered at shallow depths (approximately 1–2 m), and permeable gravel layers can allow rapid inflow.

Given this combination of weak, variable surface materials and settlement-prone clay, shallow foundations would not provide adequate bearing capacity for a high-rise reinforced concrete structure and would carry a significant risk of differential settlement. A piled foundation solution, transferring loads down to the dense sand and gravel deposits, is therefore the most appropriate approach for this site.

The most appropriate foundation solution for this type of structure is bored piles which can transfer loads to the stronger sand and gravel layers while producing low vibration, an important consideration near Singleton Hospital and busy roads. The piles will be tied together with a reinforced concrete pile cap and ground beams, creating a stable base for the reinforced concrete core and columns.

Building Envelope

The building envelope for the proposed hotel must be designed to withstand Swansea's harsh coastal climate, which includes high winds, rain, and sea air from Swansea Bay. These conditions can lead to corrosion of metal components and structures, water penetration, and faster deterioration of materials if the wrong systems are used or detailing is poor. The envelope also needs to meet fire safety requirements, provide thermal efficiency, and create an attractive appearance that fits the local character.

At ground level, brick or stone masonry is recommended because it is highly durable, offers excellent fire resistance, and blends well with surrounding architecture. Masonry also provides good acoustic insulation, which is important for guest comfort near Mumbles Road. For the upper floors, non-combustible rainscreen cladding systems are the best choice. These systems are lightweight, quick to install, and include a ventilated cavity that helps manage moisture from driving rain. Panels should be rated A1 or A2 for fire safety and finished with marine-grade coatings to resist corrosion caused by salty air. For feature areas such as the entrance, curtain wall glazing can be used to create a modern, high-quality appearance. However, large glazed areas must include solar control glass, thermal breaks, and high-performance seals to prevent heat loss and condensation during wet and windy weather.

This combination of materials provides a balance of durability, weather resistance, and aesthetic appeal, while ensuring compliance with fire safety and energy efficiency standards. Careful detailing, such as cavity fire barriers, robust sealants, and corrosion-resistant fixings, will be essential to maintain performance in Swansea's challenging climate.

Prefabrication vs On-Site Construction

The choice between prefabrication and traditional on-site construction is important for a hotel project in Swansea, especially given the adverse weather conditions such as heavy rain and strong winds. These can cause delays and increase health and safety risks during construction. Prefabrication allows many components to be manufactured in controlled factory environments, reducing exposure to bad weather and improving quality.

Prefabrication Options:

- Bathroom Pods: Fully finished bathrooms built off-site and delivered ready to install. This reduces wet trades on site and speeds up fit-out.
- Prefabricated MEP Risers: Pre-assembled service modules for plumbing, heating, and electrics. These improve quality and reduce installation time.
- Unitised Facade Panels: Large cladding panels manufactured off-site and installed quickly, reducing time working at height in poor weather.

Advantages of Prefabrication:

- Faster installation, reducing delays caused by rain and wind.
- Better quality control in factory conditions.

- Improved safety by reducing work at height and wet trades.
- Less waste and better sustainability.

Disadvantages of Prefabrication:

- Requires early design decisions and precise coordination.
- Transport and craning can be challenging in urban areas.

On-Site Construction:

- More flexible for design changes.
- Easier logistics but slower and more affected by bad weather.

Recommended Approach:

The use prefabricated bathroom pods, MEP risers, and unitised façade panels for upper floors to improve speed and quality. Build the reinforced concrete core and podium masonry on site, as these elements are less suited to prefabrication. This mixed approach balances efficiency with practicality and reduces weather-related delays.

Sustainability & Environmental Impact

Sustainability is a key consideration for the proposed hotel at Sketty Lane and Mumbles Road. The design must reduce whole-life carbon emissions, improve energy efficiency, and use materials that are durable in Swansea's coastal environment. The structural frame will use reinforced concrete, which has a high embodied carbon footprint, so measures should be taken to reduce this impact. These include using low-carbon concrete mixes with cement replacements such as Ground Granulated Blast Furnace Slag or fly ash, and optimising the structural grid to avoid over-specification.

The building envelope should use non-combustible, recyclable materials such as aluminium or fibre-cement panels with marine-grade finishes to resist corrosion. Brick or stone at podium level can be locally sourced to reduce transport emissions and support the regional economy. Prefabrication methods, such as bathroom pods and unitised façade panels, will help reduce site waste and improve material efficiency.

Energy efficiency is also critical. The envelope should achieve low U-values, minimise thermal bridging, and maintain airtightness to reduce heating demand. High-performance glazing with solar control coatings will prevent overheating in summer while maintaining daylight. Mechanical ventilation systems should include heat recovery to reduce energy use, and the building should incorporate LED lighting and smart controls.

Water management is another sustainability factor. Swansea experiences heavy rainfall, so the design should include robust drainage systems and consider green or blue roofs to manage stormwater. Landscaping can include native plants to support biodiversity and improve the site's environmental quality.

By combining these strategies, the hotel will meet Welsh sustainability standards, reduce its environmental impact, and provide long-term resilience against coastal weather conditions.

Conclusion

The assessment of the proposed hotel site at Sketty Lane and Mumbles Road shows that the building design needs to respond carefully to both the coastal environment and the ground conditions found in this part of Swansea. The weather in the area is often severe, with strong winds, heavy rainfall, and salt carried inland from Swansea Bay. These factors place additional pressure on the structure and on the external materials. With this in mind, a reinforced concrete frame with a central concrete core is the most suitable option. This type of structure offers reliable resistance to wind loads, has a high level of fire protection built into the material itself, and provides good acoustic performance for guest rooms close to busy roads and the hospital.

The ground investigation information, including data from BGS boreholes SS69SW28 and SS69SW117, confirms that the upper soils at the site are too weak to carry the weight of a medium- to high-rise building. Layers of Made Ground and soft to firm clay extend several metres below the surface, and groundwater levels are also relatively high. Stronger sand and gravel deposits only appear from around 6 metres downwards. Because of this, shallow foundations are not suitable and would increase the risk of long-term settlement. Bored piles that reach the deeper, denser layers provide the safest and most reliable solution for supporting a reinforced concrete frame on this site. For the building envelope, a mixed approach is the most practical. Using brick or stone at the podium helps the building fit into its surroundings and provides good durability at street level. Higher floors can benefit from non-combustible rainscreen cladding, which is lighter, faster to install, and better suited to taller structures. Feature areas such as entrances can use curtain wall glazing, as long as the glass and frames are specified for good thermal and weather performance.

Introducing prefabricated elements, such as bathroom pods, MEP risers, and unitised façade panels, will help control quality and reduce delays, especially since Swansea's weather can make on-site construction difficult. These methods also support cleaner construction and reduce waste. Sustainability is achieved by combining a number of measures: using low-carbon concrete mixes, improving insulation, reducing heat loss, and selecting durable materials that can cope with the marine climate. These steps help lower the building's environmental impact over its whole life.

Overall, the recommended combination of a reinforced concrete frame, piled foundations, a robust and weather-resistant envelope, and a selective use of prefabrication provides a safe, practical, and efficient solution for the location. It addresses the environmental challenges of the Swansea coastline while meeting the client's needs for a high-quality and long-lasting hotel.

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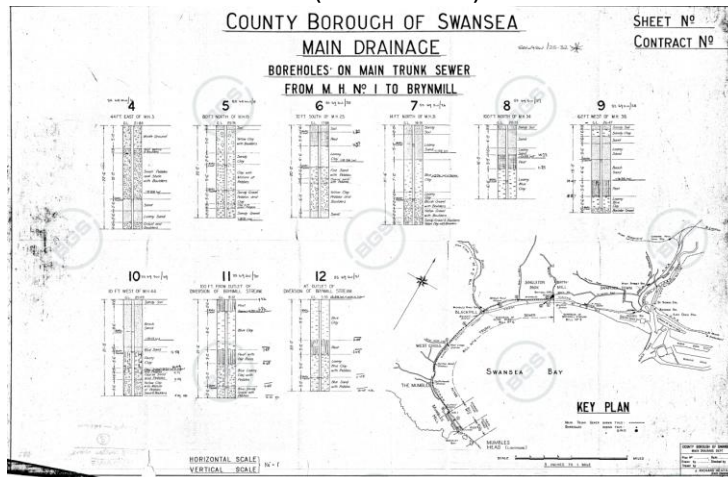
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Appendices

Appendix A — Borehole Logs

BGS borehole 370520 (SS69SW28)



BGS borehole 370609 (SS69SW117)

6235 9168

55955-117

Contract :Wales International Pool

Borehole No.

Client : City and County of Swansea

BH 8

Dates : 20/11/99 - 22/11/99

Job Number :A90841

Ground Level :10.91 m A.O.D.

Location : Swansea University Sports Centre

Engineer : WS Atkins Consultants Limited

Coordinates :961.04 E
4906.81 N

Samples		Tests		STRATA		Water	Install Backfill
Depth	Type No	Depth	Test Result, N. Blow Counts	Depth (Thickness)	DESCRIPTION		
0.00 - 1.00	B1				MADE GROUND... Very loose becoming loose blackish brown slightly clayey slightly silty very sandy fine to coarse gravel of slag and ash with occasional fragments of glass and paper		
1.00 - 1.45			(C) 1 (1; 0; 0; 1; 0; 0)	(0.30)			
2.00 - 2.45	B3				Very stiff brown slightly sandy silty CLAY with occasional gravel and some cobbles (possible boulders)	6.61	
2.00 - 2.45			(C) 2 (1; 0; 1; 2; 2; 2)	2.30			
3.00 - 3.30			(C) 3 (12; 11; 10; 9; 8; 7; 6; 5; 4; 3; 2; 1; 0)	(0.08)			
4.00 - 4.20			(C) 4 (14; 13; 12; 11; 10; 9; 8; 7; 6; 5; 4; 3; 2; 1; 0)	4.20			
5.00 - 5.45			(C) 5 (6; 7; 8; 10; 6; 11)		Dense brown slightly silty sandy fine to coarse subrounded to rounded GRAVEL with some to much cobbles (possible boulders)	6.61	
6.00 - 6.45			(C) 6 (2; 5; 7; 9; 12; 10)	(0.30)			
7.00 - 7.45	B8				Medium dense brown very sandy silty fine to coarse subangular to angular GRAVEL.	7.71	
7.00 - 7.45			(C) 7 (5; 4; 6; 10; 12; 10)	8.30			
8.00 - 8.45			(C) 8 (3; 4; 2; 5; 4; 3)				
9.00 - 9.45	B10						
9.00 - 9.45			(C) 9 (4; 3; 5; 4; 5; 5)	(0.30)			

Boring Progress and Water Observations

Groundwater

Chiselling

Date	Time	Depth	Casing	Cas. Dia.	Water	Struck	Behaviour	Sealed	From	To	Hours
20/11/99	EOO	4.20	4.00	200 mm			None observed during boring -	3.30	3.50	1	
22/11/99	08.05	4.30	4.30	200 mm	3.50		erching water to assist drilling.	3.50	3.80	2	
							Overnight influx of groundwater	3.80	4.00	1	
							between 20/11/99 and 22/11/99.	4.30	4.60	1	
								4.70	4.90	1	

Remarks: Pilon Wayfarer cable percussive drilling rig using 200 mm diameter casing and boring tools. Borehole terminated at 10.50m and backfilled with compacted aggregate.

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Appendix B - Climatic Data – Wind Speeds & Rain Fall

Monthly mean wind speed at 10 m (knots) - Mumbles Head	
Month	Wind Speed (mph)
<u>January</u>	17.18
<u>February</u>	16.36
<u>March</u>	15.31
<u>April</u>	13.90
<u>May</u>	14.09
<u>June</u>	13.56
<u>July</u>	13.64
<u>August</u>	13.85
<u>September</u>	14.52
<u>October</u>	17.23
<u>November</u>	16.62
<u>December</u>	17.51
Annual Average	15.31

Monthly rainfall totals - Mumbles Head	
Month	Rainfall (mm)
<u>January</u>	102.48
<u>February</u>	73.68
<u>March</u>	69.94
<u>April</u>	59.88
<u>May</u>	64.53
<u>June</u>	68.61
<u>July</u>	73.63
<u>August</u>	87.72
<u>September</u>	76.37
<u>October</u>	112.76
<u>November</u>	117.86
<u>December</u>	114.13
Annual Total	1,021.59

<https://www.metoffice.gov.uk/research/climate/maps-and-data/location-specific-long-term-averages/gcjjm7j5g>

Appendix C – Potential Risk Register:

Risk Rating Tolerability:

- 1–6 Low (manage by routine controls)
- 8–12 Medium (plan controls, monitor)
- 15–25 High (urgent action / redesign / phase-based control)

	Risk	Why it Matters at This Site	Likelihood (1–5)	Severity (1–5)	Risk Rating (L×S)	Key Controls / Mitigations
1	Wind-driven rain causing water ingress	Swansea Bay gets strong winds and heavy rain, especially in autumn and winter, which can push water into the building through weak points.	4	4	16	Use a façade system tested for bad weather (CWCT), fit good seals, use proper flashing and sills, and check for gaps during installation.
2	Coastal corrosion of metals	Salt in the air near the coast can rust metal fixings, brackets, and cladding parts much faster.	4	4	16	Use marine-grade stainless steel, coatings suitable for coastal areas, and choose finishes that last longer in salty air.
3	Wind uplift & cladding pressure	Winter winds in Swansea often reach 17+ mph, which increases pressure on cladding and roof fixings.	3	4	12	Design the structure for high winds, use secure fixings, follow wind-load standards, and plan crane lifts when winds are low.
4	Foundation settlement	The ground has Made Ground and soft clay up to about 6m deep, which can move or settle under heavy loads.	3	5	15	Use deep bored piles into dense sand/gravel, monitor the ground during construction, and make sure pile caps are built correctly.
5	Groundwater inflow during excavation	The site has shallow groundwater and layers of gravel that let water flow in quickly during digging.	3	4	12	Use pumps, plan for dewatering, use temporary casings for piles, and avoid leaving holes open for too long.
6	Noise & vibration near Singleton Hospital	Construction noise and vibration could disturb the hospital nearby.	3	3	9	Use bored piles (not driven), monitor noise, agree working hours, and use noise barriers if needed.
7	Programme disruption from adverse weather	Swansea often has long periods of rain and wind which delay concrete pours, lifting operations, and facade installation.	4	3	12	Use prefabrication for pods, MEP risers, and façade panels to reduce time on site. Build in weather delays into the programme.
8	Wind-blown sand blocking drainage	Wind-blown sand can block balcony drains and cause water to build up.	3	3	9	Use bigger outlets, include overflow routes, keep drains easy to clean, and protect openings on site.
9	Fire safety issues in external walls	A high-rise hotel needs non-combustible cladding and properly installed fire-stops.	2	5	10	Use A1/A2 rated materials, fit cavity barriers, and use tested and approved wall build-ups.