

ACBA5019 – Construction Technology 2
Assignment:
New Hotel Proposal Report – Part 2

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Introduction

Background and continuation with Assignment 1

This report forms a direct continuation of Assignment 1, which established the proposed design for a medium- to high-rise hotel at the junction of Sketty Lane and Mumbles Road, adjacent to Singleton Hospital in Swansea. Assignment 1 identified a reinforced concrete frame with a central core, bored piled foundations, and a hybrid facade strategy comprising a masonry podium with non-combustible rainscreen cladding at upper levels. These design decisions were driven by local ground conditions, coastal exposure, fire safety requirements, and programme considerations.

Building on this foundation, the current report critically evaluates the buildability and sustainability implications of those established design choices. Rather than restating the design, this assessment critically considers how effectively the proposed orientation, materials, construction methods, and site strategies perform in practice, particularly in terms of reducing environmental impact, improving long-term performance, and supporting efficient delivery on a constrained urban site.

Purpose, Scope, and Objectives

The purpose of this report is to demonstrate critical understanding of how construction technology choices influence environmental outcomes and buildability in practice. The assessment moves beyond descriptive commentary and instead considers advantages, limitations, trade-offs, and risks associated with the adopted design.

The specific objectives are to:

- Critically evaluate the environmental impact of building orientation, form, and material selection established in Assignment 1.
- Assess the feasibility and value of integrating facade greening and Sustainable Urban Drainage Systems (SUDS) within the constraints of the site.
- Analyse buildability factors, including construction methods, logistics, sequencing, and programme risk, with reference to the proposed structural and envelope systems.

Site Location:

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



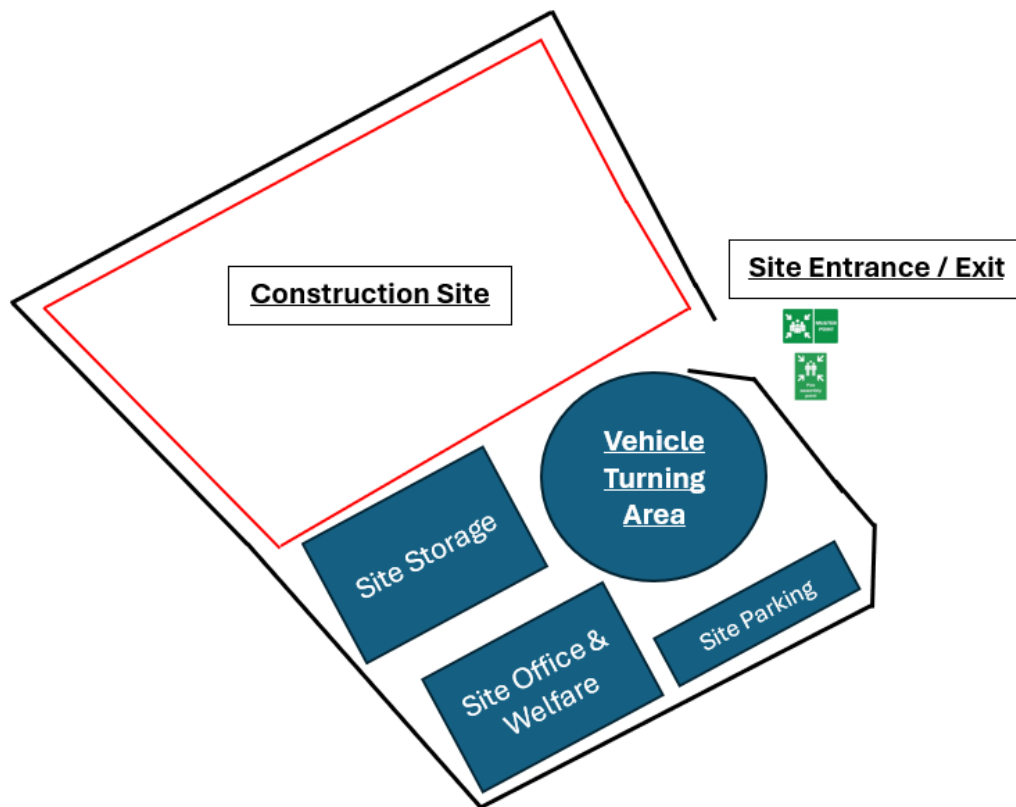
View from Mumbles Road: [Mumbles Rd - Google Maps](#)



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



Site Diagram:



Environmental Impact Assessment

Building Orientation: Environmental Efficiency Versus Site Constraints

As identified in Assignment 1, the proposed hotel is arranged with its longer elevations orientated broadly along an east/west axis, allowing principal facades to face north and south. From an environmental perspective, this orientation supports improved daylight distribution and reduced cooling demand when compared to a predominantly east/west glazed facade arrangement.

South-facing facades provide higher levels of winter solar gain and daylight, reducing reliance on artificial lighting and contributing to lower operational energy use. But, this benefit must be critically balanced against the increased risk of summer overheating, particularly in hotel bedrooms where occupants have limited control over ventilation.

The proposed use of solar-control glazing and recessed facade articulation, as described in Assignment 1, partially mitigates this risk but introduces higher facade costs and greater detailing complexity.

North-facing elevations benefit from consistent daylight with minimal glare, improving visual comfort and reducing cooling loads. By limiting east-facing and west-facing glazing, the design avoids exposure to low-angle solar gain, which is difficult to mitigate through shading alone. Overall, the chosen orientation represents a practical compromise between environmental performance and the fixed geometry of the site, although it remains reliant on facade specification and operational management to achieve its full energy-saving potential.

Passive Ventilation and Coastal Exposure

Assignment 1 proposed limited natural ventilation through opening windows and ventilated facade cavities. From a sustainability viewpoint, this approach can reduce reliance on mechanical systems, particularly in circulation and public areas. However, in a coastal and high-wind environment such as Swansea, reliance on natural ventilation is naturally restricted.

Strong prevailing winds and frequent driving rain limit the times during which windows can be safely opened without compromising comfort or water ingress risk. As a result, the environmental benefit of passive ventilation is likely to be modest and should be regarded as supplementary rather than a primary strategy. The design therefore arguably relies on mechanical ventilation with heat recovery, recognising that theoretical passive strategies must be critically assessed against real operational conditions.

Whole-Life Carbon and Material Selection

In Assignment 1, the reinforced concrete frame was selected for its robustness, fire resistance, and suitability for a medium-rise to high-rise structure. From a sustainability perspective, this choice presents a clear trade-off. Concrete has a high embodied

carbon impact compared with steel or timber alternatives, particularly in the substructure and frame.

However, based on a critical whole-life assessment and typical performance observed in comparable coastal projects, the continued use of reinforced concrete is justified for this scheme. The building's design life is expected to go beyond 60 years, and the durability of concrete in a coastal environment reduces the likelihood of premature replacement or extensive structural intervention. When combined with low-carbon concrete mixes incorporating cement replacements such as Ground Granulated Blast-furnace Slag (GGBS), the initial embodied carbon impact can be partially mitigated.

Externally, the masonry podium detailed in Assignment 1 provides excellent resistance to impact, weathering, and vandalism. While masonry has a relatively high embodied carbon at manufacture, its long service life and minimal maintenance requirements support whole-life sustainability objectives. Equally, the non-combustible rainscreen cladding at upper levels offers adaptability, allowing damaged panels to be replaced without wholesale facade renewal. This modularity represents a clear sustainability benefit when evaluated across the building's life cycle.

Architectural Quality as a Sustainability Factor

The architectural approach established in Assignment 1 prioritised contextual integration at street level through the use of brick or stone, with lighter materials above. From a critical perspective, this strategy supports sustainability by improving the building's long-term acceptability within its surroundings.

Buildings that are visually discordant or insensitive to context are more likely to face pressure for redevelopment or heavy refurbishment. The proposed aesthetic balancing contemporary upper levels with a robust masonry base enhances the likelihood that the building will remain in use over its full design life, indirectly reducing future demolition and redevelopment impacts.

Facade Greening and Sustainable Urban Drainage Systems

Facade Greening: Benefits Versus Practicality

Facade greening was not a core element of the original design in Assignment 1 but was identified as a potential enhancement. Critically, full-height green facades are not considered appropriate for this site due to wind exposure, salt spray, and maintenance risk. As such, facade greening is best limited to selective and sheltered locations.

Environmental Value

Where appropriately located, green facades can provide marginal reductions in surface temperatures, improve air quality, and enhance biodiversity. Their most tangible benefit in this scheme is visual, improving the hotel's interface with the public realm at podium level.

Limitations and Risks

In coastal environments, green facade systems introduce additional risks, including plant failure, irrigation leakage, and ongoing maintenance costs. Without a clear long-term maintenance strategy, such features risk becoming liabilities rather than sustainable assets. Consequently, their use should be carefully justified and limited to areas where they clearly add value.

Sustainable Urban Drainage Systems (SUDS)

SUDS represent a more robust and impactful sustainability strategy for the Swansea context than facade greening. High annual rainfall and storm events place pressure on local drainage infrastructure, making surface water management a critical design issue.

Integration with Assignment 1 Layout

The landscape and roof layouts established in Assignment 1 provide opportunities to integrate permeable paving, attenuation tanks, and green or blue roof zones. These measures directly reduce runoff volumes and peak discharge rates, improving resilience to climate change.

Buildability and Performance

From a construction perspective, SUDS are low-risk, well-understood systems that can be integrated alongside external works. Their environmental benefit is clear and measurable, making them a strong contributor to both sustainability targets and planning compliance.

Buildability

Structural System: Practicality Versus Carbon Impact

From a construction and sequencing perspective, the reinforced concrete frame and core selected in Assignment 1 offers high buildability for a building of this scale. Repetition of floor plates suits hotel layouts, simplifies formwork, and supports a predictable construction sequence.

While alternative systems such as steel or hybrid frames could reduce structural weight, they would introduce additional fire protection requirements and corrosion risks in a coastal environment. The selected concrete solution therefore represents a pragmatic balance between sustainability ambitions and construction reliability.

Foundations and Site Constraints

Bored pile foundations, identified in Assignment 1, directly respond to weak Made Ground and clay strata. From a buildability standpoint, this approach minimises vibration and noise near Singleton Hospital, reducing risk and programme disruption. However, bored piling requires careful management of groundwater and spoil arisings. These challenges add cost and environmental impact but are unavoidable given the ground conditions. The decision to adopt bored piles demonstrates a prioritisation of safety and certainty over theoretical cost savings.

Prefabrication and Programme Certainty

The selective use of prefabrication, including bathroom pods and MEP risers, directly addresses labour availability, weather risk, and programme predictability. While prefabrication reduces design flexibility once manufacturing begins, the repetitive nature of hotel accommodation makes this trade-off acceptable.

This approach aligns with the construction sequence established in Assignment 1 and strengthens both buildability and sustainability outcomes through reduced waste and improved quality control.

Logistics, Risk, and Construction Management

The constrained urban location requires disciplined logistics planning. Just-in-time deliveries, controlled crane operations, and phased works are essential to avoid disruption to surrounding roads and hospital operations.

Weather risk remains a significant constraint, particularly for facade installation and lifting operations. The reliance on prefabricated facade panels reduces exposure time at height, representing a clear safety and programme benefit.

Appraisal of Materials, Constructional Forms, and Methodological Techniques

This section provides a comparative appraisal of structural materials, constructional forms, and delivery methodologies appropriate for medium- to high-rise buildings, with reference to the Swansea hotel scheme established in Assignment 1.

Structural Materials for Medium- to High-Rise Buildings

Reinforced Concrete

Reinforced concrete remains one of the most widely adopted materials for medium- to high-rise buildings. Its inherent fire resistance, acoustic mass, and robustness make it particularly suitable for hotels and residential developments where occupant safety and comfort are critical. In the Swansea context, concrete also performs well in a coastal environment, provided adequate cover, mix design, and corrosion protection are specified.

The principal limitation of reinforced concrete is its high embodied carbon, largely due to cement production. However, when assessed on a whole-life basis, this impact can be partially offset through durability, reduced maintenance, and the use of low-carbon concrete mixes incorporating cement replacements such as GGBS. For the proposed hotel, reinforced concrete represents a pragmatic balance between performance, longevity, and buildability.

Structural Steel

Steel framing systems offer advantages in terms of speed of erection, structural lightness, and adaptability. These characteristics can be beneficial where programme

speed or long-span requirements dominate. However, in medium- to high-rise hotels, steel frames typically require additional fire protection and enhanced corrosion control, particularly in marine environments. These requirements increase construction complexity, maintenance demand, and whole-life costs.

While steel remains a viable alternative, its disadvantages for this specific site justify the preference for reinforced concrete.

Hybrid Structural Systems

Hybrid systems, such as concrete cores combined with steel floor framing, aim to combine the stability of concrete with the speed of steel construction. Although effective in some tall-building applications, they introduce increased design coordination and interface risk. For a hotel with repetitive layouts and moderate height, the additional complexity offers limited benefit, reducing overall buildability.

Constructional Forms and Structural Systems

Frame and Core Systems

Medium- to high-rise buildings commonly rely on framed structures combined with stability systems capable of resisting lateral loads. The flat slab reinforced concrete frame with a central concrete core adopted in Assignment 1 is well suited to hotel use, enabling repetitive floor plates, simplified formwork, and efficient vertical load transfer. The central core provides lateral stability and accommodates lifts and services, reducing perimeter structural complexity. This structural clarity enhances construction efficiency and minimises tolerance issues during erection.

Alternative Structural Forms

Other systems, such as braced frames, moment-resisting frames, or outrigger systems, are typically reserved for taller or more architecturally expressive buildings. While these systems can increase stiffness and reduce overall material quantities, they also introduce greater construction complexity and coordination risk. For the scale of the Swansea hotel, the adopted frame-and-core system represents a proportionate and buildable solution.

Construction Methodologies and Techniques

In-Situ Construction

Traditional in-situ concrete construction remains a reliable and flexible method for medium- to high-rise buildings. It allows design adjustments during construction and is well understood by the UK construction industry. However, it is vulnerable to weather-related delays, particularly in exposed coastal locations such as Swansea.

Modern Methods of Construction (MMC)

Modern Methods of Construction, including prefabrication and offsite manufacture, offer improved quality control, reduced waste, and greater programme certainty. In hotel developments, repetition of room layouts makes MMC particularly effective. The use of prefabricated bathroom pods, MEP risers, and façade panels, as identified in Assignment 1, reduces on-site labour demands and time spent working at height.

This hybrid approach combines the robustness of in-situ structural works with the efficiency of offsite manufacture.

Concepts of Buildability, Sustainability, and Flexibility in Building Structures

This section explains and applies the key concepts of buildability, sustainability, and flexibility to medium- to high-rise structures, with direct reference to the proposed hotel scheme.

Buildability

Buildability describes how effectively a design supports safe, efficient, and economical construction. For medium- to high-rise buildings this is driven by repetition, clear load paths, construction sequencing, and logistics.

The proposed hotel demonstrates good buildability through a regular structural grid, repetitive floor plates, a central reinforced concrete stability core, and selective prefabrication. These measures reduce temporary works complexity, improve sequencing, and minimise weather exposure, leading to improved programme certainty and site safety.

Indicative Wind Load Considerations

Due to the exposed coastal location, wind loading is a key factor affecting structural stability, façade installation, and crane operations. In accordance with BS EN 1991-1-4, a basic wind velocity for Swansea of approximately 24–25 m/s may be adopted at outline stage.

Peak velocity pressure is estimated using:

$$q_p = 0.5 \times \rho \times v^2$$

Assuming air density $\rho \approx 1.25 \text{ kg/m}^3$ and $v \approx 25 \text{ m/s}$:

$$q_p \approx 0.39 \text{ kN/m}^2$$

This pressure increases with height and exposure and supports the selection of a robust reinforced concrete core to provide early stability and safe construction sequencing.

Sustainability

Structural sustainability is addressed through whole-life material selection, durability, operational efficiency, and resilience to climate impacts. For this scheme, sustainability is delivered through low-carbon concrete mixes, efficient orientation, durable envelope materials, and Sustainable Urban Drainage Systems (SUDS).

Indicative SUDS Sizing

Surface-water management is critical given Swansea's high rainfall.

An outline SUDS assessment has been undertaken based on the following assumptions:

Roof drainage area: $\sim 3,000 \text{ m}^2$

Design storm: 1 in 100 year + 40% climate change

Rainfall intensity: 60 mm/hr

Runoff volume:

$V \approx 0.06 \text{ m} \times 3,000 \text{ m}^2 \approx 180 \text{ m}^3$

This volume can be accommodated through underground attenuation tanks in combination with blue/green roofs, permeable paving, and landscaped swales to regulate discharge rates and reduce downstream flood risk.

Flexibility

Flexibility is the capacity of a building to accommodate future change with minimal structural intervention. This is essential for long-life medium- to high-rise buildings. The reinforced concrete frame with regular column spacing allows internal reconfiguration using non-loadbearing partitions. Typical hotel grids of 7–8 m provide sufficient adaptability for alternative future uses, such as residential or serviced apartments. Modular façade systems and prefabricated service zones further support future upgrading without invasive works.

Integrated Application in Medium- Rise to High-Rise Design

Buildability, sustainability, and flexibility are interdependent. Wind loading influences structural form and sequencing, SUDS sizing informs site layout and groundworks, and structural grids affect adaptability and efficiency. The proposed design integrates these factors to deliver a buildable, sustainable, and resilient medium- to high-rise hotel.

Conclusion

This report has evaluated the buildability and sustainability of the proposed medium- to high-rise hotel at Sketty Lane and Mumbles Road, Swansea. Building on Assignment 1, the assessment shows that a reinforced concrete frame with a central stability core and selective prefabrication provides a balanced response to coastal exposure, ground conditions, and programme risk.

The appraisal of alternative materials, structural forms, and construction methodologies confirms that the selected approach, while carrying higher initial embodied carbon, is justified on a whole-life basis due to durability, safety, buildability, and adaptability. Sustainability is achieved through informed trade-offs, supported by indicative wind and SUDS calculations, while flexibility is embedded through regular structural grids and modular systems.

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Appendix 1 - Construction Storyboard

1. Pre-Construction & Planning Design freeze, surveys, logistics planning
2. Site Set-Up Hoarding, welfare, temporary services
3. Groundworks Excavation, dewatering, piling
4. Substructure Pile caps, ground beams, basement slab
5. Superstructure Core RC core construction (jump-form)
6. Superstructure Frame RC columns and flat slabs
7. Envelope Installation Rainscreen, masonry podium, glazing
8. Services & Fit-Out MEP risers, bathroom pods
9. External Works & SUDS Attenuation tanks, paving, landscaping
10. Testing, Commissioning & Handover