

CONSTRUCTION TECHNOLOGY 2

ASSIGNMENT ONE

DESIGNING A STUDENT ACCOMMODATION IN SA1 FOR UWTSD

This is a good example of what the individual rooms will look like, give or take design alterations with furnishings.



STELLING PROPERTIES (2023) STUDENT ACCOMMODATION - STELLING PROPERTIES.
[HTTPS://WWW.STELLINGPROPERTIES.COM/STUDENT-ACCOMMODATION/](https://www.stellingproperties.com/student-accommodation/).

FINN GALE- 2326098

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INTRODUCTION

This building will include all luxuries that a student accommodation would require. From Student lounges with games rooms adjacent, to flats with private kitchens and bathrooms and more. A lift accompanied by a fire escape stairwell will take students / visitors all the way to the top of the medium rise building. A designated space for a student union - where students and a like can group and discuss any relevant political issues they may face. Having this would show that the university is happy and willing to help the union. The location is a short walk to the very popular wind street, the perfect place for students to blow off a little steam. Surrounding this there are many restaurants and supermarkets which provide a very accessible way of living while studying. Parking is a very common issue with students, A few of my friends only drive one car per accommodation as there simply isn't enough spaces to park. Here that will not be an issue. There is a very large car park roughly two minutes down the road towards the campus as well as another car park across the water which is free to use for any student of UWTSD. The library is also very close and provides a great place to focus on some studying. All in all, this is an excellent location with many prospects to come. This report is going to explain how and why each construction element is needed and what is preferred when surveying in areas such as this.

The size of the proposed CDM area is 112m x 30m, this makes for a 3,360m² construction area. This size of building and project is going to require large cranes capable of constructing the building around themselves.

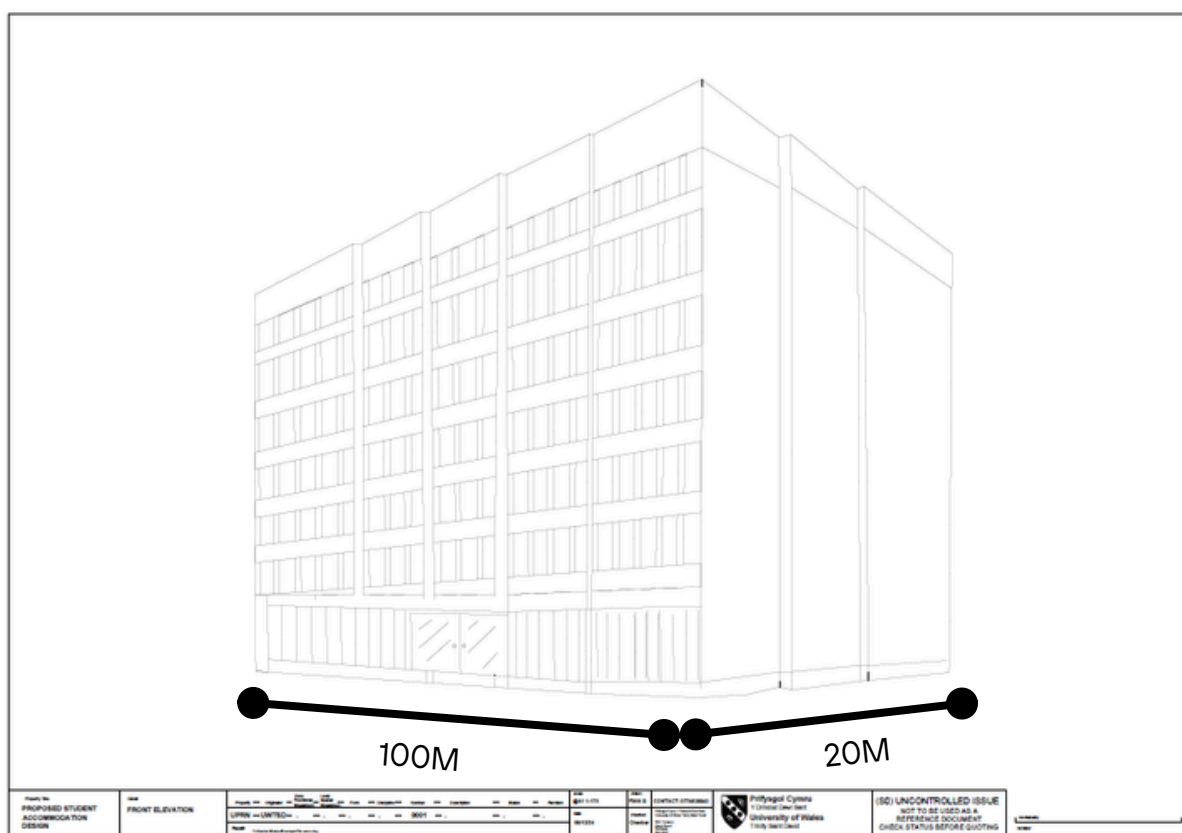


This is the location of the proposed student accommodation. Swansea waterfront SA1.
(This image was taken off of Google maps and has been referenced)

DESIGN PROPOSAL

A seven storey building including the ground floor lobby, which will also have tenanted rooms located within. Each room will have a private ensuite equipped with a shower, sink and toilet. There will be two shared kitchens per floor, averaging at seven tenants per kitchen. There is consistently fifteen rooms per floor, separated by two staircases at each end of the building. Due to the potential fire hazard, there is an automatic door that opens in the middle of the floor that allows students to access both staircases.

The façade of this building will be largely consumed by insulated cladding stretching across each floor surrounding the windows.



This is a rough CAD sketch that I have drawn to give a better example of what my building will look like once completed. It has seven floors including the ground floor / lobby. Consisting of 100m x 20m, this fits into the area with enough room for wide footings on top of the piles.

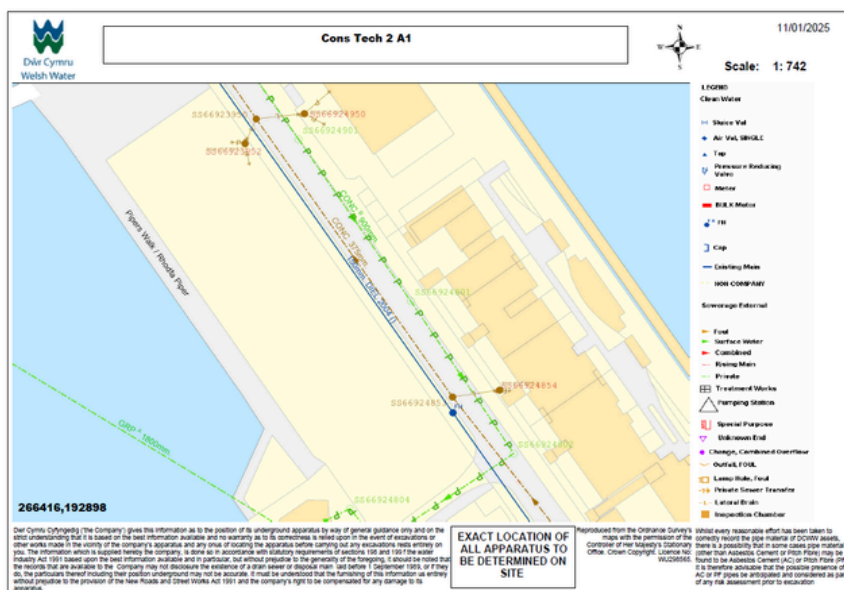
The building will be equipped with a wet riser to allow rapid response for firefighters to tackle any high rise flames that could potentially start, these will be on every floor 18m apart. It will also have a earth connecting lightning rod that will catch any stray bolts and send them straight into the neutral earth/ground.

STRUCTURAL AND FOUNDATION TYPE

I WILL BE GOING WITH PILE FOUNDATIONS TO HOLD THE ACCOMODATION IN PLACE. AS YOU CAN SEE TO THE RIGHT, THIS CONSISTS OF MANY DEEP PILES STRETCHING FAR INTO THE GROUND.



Pile foundations are commonly used on medium to high rise buildings where the ground is too unstable to hold the weight of said building. In this case, the ground is made up of clay, sand, silt and gravel. Having clay here can potentially cause major issues due to the river adjacent. I am going with deep pile foundations with pile caps to ensure no unnecessary movement takes place.



Naturally, concrete will be used as the footings for any base work. These will have to be professionally prepped and shuttered using plywood and rebar for strength.. Concrete will also be used in the load bearing structures in place within the building, this is due to its density, strength and unlikeliness to move in time while holding heavy loads. The . Universal steel beams otherwise known as H-beams will be used to hold the building in-between separate floors, these will delivered from Tata steel as the most reliable supplier.

The floors between each floor will be in-situ cast concrete, this will naturally be reinforced with rebar to add to the buildings structural integrity. These floors being cast in-situ allows for a multitude of benefits. such of which can include an increase of flexibility allowing for the contractors to tailor the floors to the buildings exact size and load bearing capacity, this can include effective distribution of load transfer which in turn can improve stability massively.

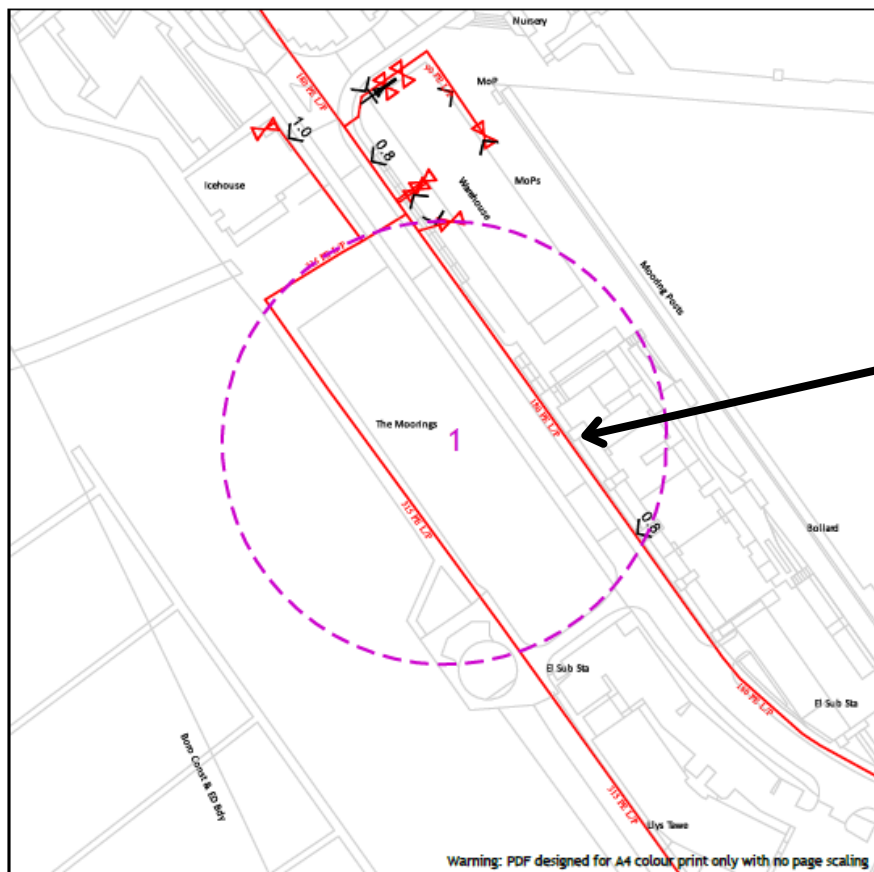
A major benefit to having in-situ cast concrete floors over precast is safety, in both the construction phase and for the foreseeable future. Raising large concrete slabs higher and higher as the building progresses only exceeds in danger to each worker involved. It also allows for the floors to have an excellent fit when sealing. When concrete is cast in place, a seal is created surrounding the floor, meaning that each floor will be resistant moisture, fire and pests such as rodents. All of which enhances the buildings lifespan.

Other notable characteristics of concrete is that it has a good thermal mass which will help regulate indoor temperatures by storing and releasing heat around the building. it is also a very good damper for vibration and noise, eliminating any potential neighbouring arguments.

PILE FOUNDATION CHOICE AND WHY

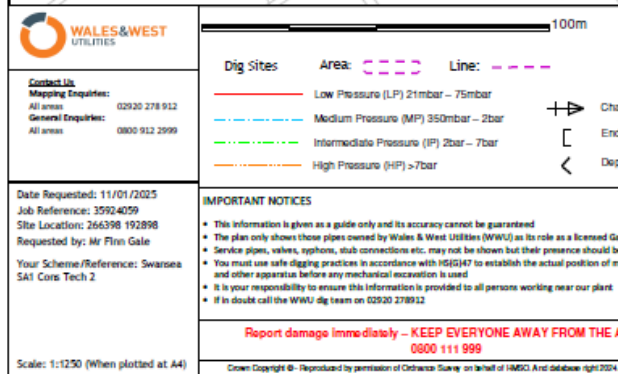
Pile foundations are great choice when the ground at hand is unstable or susceptible to subsidence. This is due to the depth of piles, they go much deeper than typical foundation types such as standard footings and reach much more stable soil or rock to transfer the load across, these harder layers make it difficult for piles to be worryingly affected by settlement issues. Due to being neighbours with the river Tawe, it is worth noting that these foundations are almost unaffected by water saturation unlike more shallower foundation types which can potentially lose their strength. The most effective type of pile foundation for this area would be end-bearing piles due to them focussing on transferring the load directly to the firmer ground below.





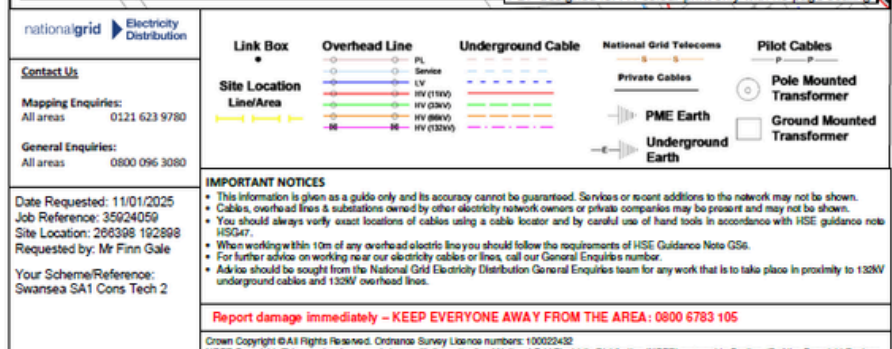
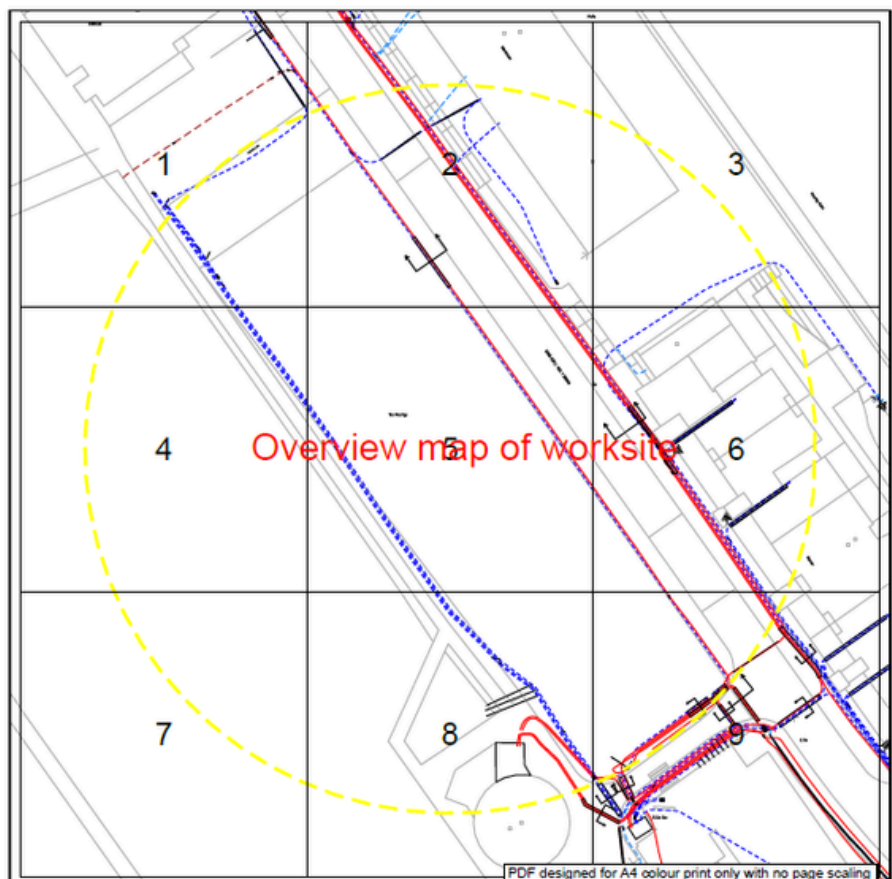
These are "Line search before U dig" maps that show any potential electrical, sewage, clean water etc underground lines that could be affected when excavations begin.

These solid red lines indicate a Low Pressure (21mbar to 75mbar) line. However, lucky for us, it does not protrude into the accurately defined CDM area.



As you can see to the right, there a few overhead lines that could alter the way that the construction phase takes place.

The blue dotted line is an underground cable, we will have to be aware of this and make sure we carry out regular CAT scans as we progress.



BUILDING ENVELOPE

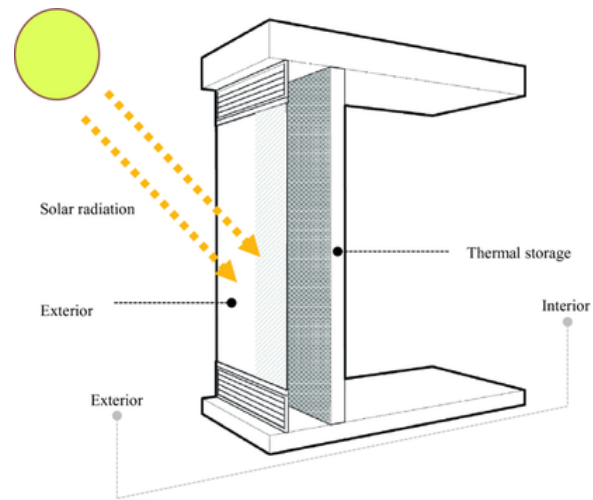
Each element of this building will need to work together to maximise the thermal consistency potential. This makes choosing which materials to use for the roof, exterior/interior walls, doors, windows and HVAC difficult.

ROOFING

The roof covering for this building will be in the regards of a concrete flat roof with access to all service and maintenance points of interest. This will need to have edge protection to stop any employees or tenants who manage to gain access to the roof. On the areas where there are no utilities, there will a bitumen/asphalt based roof that slopes to allow for drainage.

WALLS

Exterior claddings will consist of concrete panels with an exterior insulation finishing system (EIFS) to provide the thermal element. As mentioned in the structural part of my report, the internal walls and frame will be concrete and steel providing full load bearing support. The insulation used within these will be of similar to 70mm Kingspan or Celotex in terms of heat retention.



WINDOWS

Double glazed PVC windows throughout the building to minimise temperature/heat transfer. I will be using PVC due to the number of benefits including sound proofing, energy efficiency, durability, price, recyclability and fire resistance. Identical to the doors I will be using where necessary, these windows will be FD30 rated, meaning that they have a 30-minute fire resistance rating which will give the tenants more than enough time to exit the building.

DOORS

As mentioned, the majority of the doors will be rated at a minimum FD30. The only doors where this will not be the case is closet and bathroom doors as there is no need. These will be on swinging mechanisms and will be made of oak wood due to its longevity and security. They will also have emergency lighting above that light up when the buildings power has been cut.

FLOORS

As mentioned in the structural part of the report, the floors will be made out of concrete. Once sealed with the correct moisture / insulation barriers it will be very difficult for any temperature chance to show. Due to the floor being a solid detail, it will also be very difficult for an fire/smoke to escape through.

INSULATION AND HVAC

There will be service voids on every floor to provide each room with adequate fresh moving air which is a requirement to stop any damp / mould forming. A continuous layer of insulation around the building will be in place to maximise the energy proficiency and minimise heat loss.

ELECTRICAL

Connecting the building to the main electrical grid will require a substation due to the size of the building, I will also install a main distribution board (MDB) at the ground floor to manage the power throughout the property, each floor will also have their own sub-distribution board. Meters will also be installed for monitoring each apartment. We will have general lighting, emergency lighting over every emergency exit doorway and hallway and external lighting for entering the building at night. Each room will also succumn to WHQS24, regarding socket outlets and USB ports.

METHOD OF CONSTRUCTION ON SITE OR PREFAB?

Due to the nature of this building, I will be using a group of hybrid construction methods, depending on which material and where will determine whether or not they will be fabricated on site or in a factory.

For the steel H-frames, these will have to be pre-fabricated off site. The insulated cladding panels will also be manufactured off site as this is one of their highest selling points as now the contractors on site only now have to slot them into place. They will arrive on a flat bed on the back of a HGV, most likely from Rockpanel or Llrita Building Systems, this is due to their good reviews as suppliers and their current price work. Fabricating insulated cladding on site would cause tremendous issues with space and working conditions.

However, having these constructed off site saves great time and ensures faster project delivery thanks to the minimising of weather delays, if these materials were being fabricated on site, rain, snow and wind would all affect the time frame. Having the materials that are required delivered at the right time will help in pushing the construction phase along and minimising site disruption.

On-site construction, these will be built/assembled on site due to their size, nature or limitations. The pile foundations will be first, they are far too overweight for transport and will require heavy machinery to move, when on site they will be bored/screwed into the ground to hold the structure at bay. The concrete throughout the building is going to be cast in-situ also, meaning that the contractors will need to create shuttering and frames with rebar in the centre to hold the concrete when poured. This does create issues of how to get the liquid cement to each section, however, can be tackled in different ways, the best being a length of hose pump. This also eliminates any need for transporting very heavy precast panels halfway across the country. The steel H-beams in question have been constructed off site, the erection of these beams to their foreseeable position is a much larger job and will require a heavy duty crane to lift while the workers push into position and use tools such as a rivet gun and welder to bond them together.

Having these materials built on site creates massive benefits for all stakeholders, there is now greater flexibility for when adjustments need to take place during the construction phase.



CONSIDERATIONS

While designing a medium rise building, there are many building regulations that need to be carefully considered. All of them are as important, from approved document A down to P for this project. I will delve a bit deeper into document B, fire safety as this is a ongoing issue we have in this country regarding cladding on medium to high rise buildings.

Approved document B (ADB) is critical in ensuring that fire safety is a very high priority when designing a building in the UK, it sets out specifics such as the containment of a fire, prevention and evacuation. It will affect all parts of the construction, including structural. The steel H-beams I have used as my frame is of certain grade as per the buildings dimensions and weight. The document states that any building that falls over 18m in height, all load bearing elements must have a minimum fire resistance of 90 minutes. This is fine for my building as the steel beams will have been coated with 'Glasroc F Firecase 15mm' by a company called 'British Gypsum' which ensures that they will last for the required timeframe. Due to the nature of the building, each tenanted room must be considered as fire-separating elements, as such, each internal partition wall will need to be fire resistant of up to at least one hour, we will use 'Knauf Fire Panel Plasterboard' which meets high safety standards. I am going to use a fire compartmentalisation company that I am familiar with, Aeon. They are a Swansea based company who specialise in fire compartmentalisation both surveys and installation. All of the windows surrounding any fire exits will have fire-resistant glazing to ensure maximum safety, we will also have a fire escape on both sides of the building stopping at each floor. There will be fire alarms and sprinklers in each room and will be in compliance with BS 5839-1 or BS 5839-6 standards for residential buildings. Unfortunately, there is minimal room outside for a fire engine to park, so the street would have to be blocked while an emergency is taking place.

CONCLUSION

Overall, I believe that all of the design and construction methods in this plan work well together and will provide a safe and comfortable student accommodation for UWTSD. Starting strong with pile foundations with caps, a fire-resistant steel frame to create the skeleton, pre-fabricated insulated exterior panels with double glazed fire resistant windows for light. Concrete floors of which are sealed to the frame and load bearing walls inside to create a compartment, Knauf plasterboard to provide maximum fire resistance partition walls with a flat service area roof for maintenance to take place in the future. I think this will be a good choice for the university and its students due to the location, choice of materials and design of the rooms, but most importantly the safety.

APPENDIX

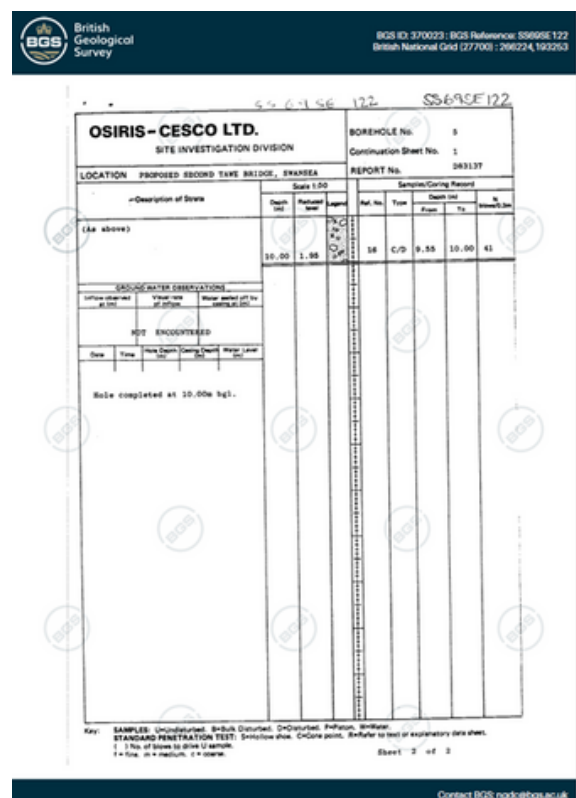
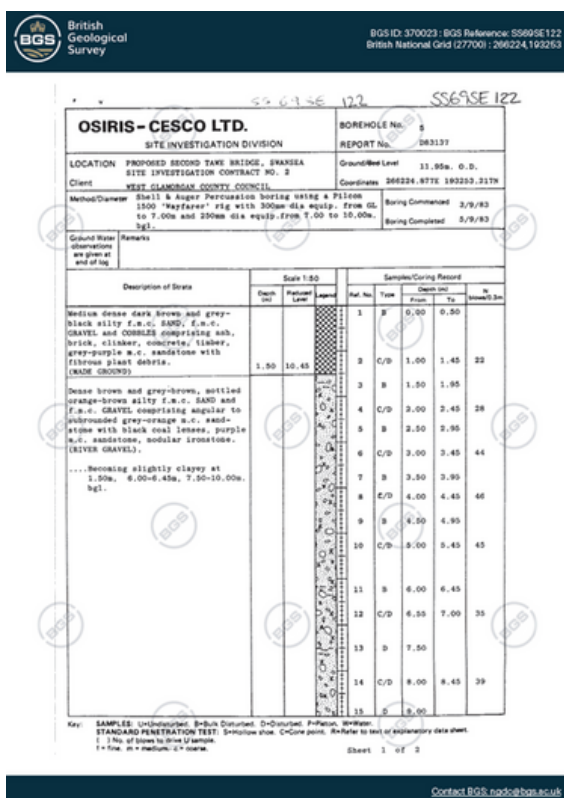


These two photos were taken when I went on a quick site visit, this shows how the contractors and stakeholders are progressing with the current plans.



This is the link to Approved Document B (Fire Safety)
https://assets.publishing.service.gov.uk/media/639ae876e90e0721839ea637/Approved_Document_B_fire_safety_volume_2_-_Buildings_other_than_dwellings_2019_edition_incorporating_2020_and_2022_amendments.pdf

These two below are the bore logs from the current site



REFERENCES

- 1. Dwr Cymru Cyfyngedig (2025) Position of underground apparatus guidance. <https://gisportal.dwrcymru.com/Geocortex/Essentials/REST/TempFiles/A4%20Network%20Landscape.pdf?guid=734daf19-cb7b-412d-ac8e-a29a90d926ed&contentType=application%2Fpdf>. Accessed on 28/12/24
- 2. LSBUD (Linesearch BeforeUdig) (2024) LSBUD - home. <https://lsbud.co.uk/#/>. Accessed on 28/12/24
- 3. What is Pile Foundation? Types of Pile Foundation (no date). <https://civiltoday.com/geotechnical-engineering/foundation-engineering/deep-foundation/176-pile-foundation-definition-types>. Accessed on 29/12/24
- 4. Google Maps. https://www.google.com/maps/@51.6189891,-3.930836,17.86z?entry=tту&g_ep=EgoyMDI1MDEwOC4wIklXMDSoASAFQAw%3D%3D Accessed on 03/01/25
- 5. Collins, M. (no date) In-situ concrete suspended floors. <https://www.concrete.org.uk/fingertips-nuggets.asp?cmd=display&id=244>. Accessed on 03/01/25
- 6. Hachem-Vermette, C. (2020) 'Introduction to building envelope,' in Green energy and technology, pp. 29–65. https://doi.org/10.1007/978-3-030-47016-6_2. Accessed on 04/01/25
- 7. Rockpanel (2018) Rockpanel for exterior cladding. https://www.googleadservices.com/pagead/aclk?sa=L&ai=DChcSEwiSrZPWpPqKAXXfj1AGHWycEtgYABACGgJkZw&ae=2&aspm=1&co=1&ase=5&gclid=EALalQobChMlkq2T1qT6igMV349QBh1snBLYEAAyAAEgJBePD_BwE&ohost=www.google.com&cid=CAASJORocyqNzEBrdpv9IpiqETwnEJsSOHrgQSDmiHixCzsUEFCCw&sig=AO D64_ODKuX8tK_mGY-bY2O1ZeCKyX-NeQ&q&adurl&ved=2ahUKEwjPz43WpPqKAXU3QEEAHc9dAHUQ0Qx6BAGLEAM. Accessed on 04/01/25
- 8. Graphite Insulation | Licata Therm Graphite | Licata Ltd (2025). https://www.googleadservices.com/pagead/aclk?sa=L&ai=DChcSEwiSrZPWpPqKAXXfj1AGHWycEtgYABADGgJkZw&ae=2&aspm=1&co=1&ase=5&gclid=EALalQobChMlkq2T1qT6igMV349QBh1snBLYEAAyAAEgKLzfD_BwE&ohost=www.google.com&cid=CAASJORocyqNzEBrdpv9IpiqETwnEJsSOHrgQSDmiHixCzsUEFCCw&sig=AO D64_30LWiTEmylkEb_9C_h7pB_8z5OCw&q&adurl&ved=2ahUKEwjPz43WpPqKAXU3QEEAHc9dAHUQ0Qx6BAGLEAE. Accessed on 06/01/25
- 9. Modulize (2023) Making Offsite Construction platforms work! <https://www.linkedin.com/pulse/making-offsite-construction-platforms-work-mdlz>. Accessed on 05/01/24
- 10. Cut heating costs with exterior wall cladding insulation (no date). <https://www.mycladding.com/cut-heating-costs>. Accessed on 07/01/25
- 11. Building Regulations 2010 Approved Document B Volume 2, 2019 edition (2019) Building Regulations 2010. https://assets.publishing.service.gov.uk/media/639ae876e90e0721839ea637/Approved_Document_B_fire_safety_volume_2_-_Buildings_other_than_dwelling_2019_edition_incorporating_2020_and_2022_amendments.pdf. Accessed 16/01/25
- 12. Buy Insulation Online (2022) Knauf Fire Panel – Fire-Resistant insulated plasterboards. <https://www.buyinsulationonline.co.uk/product/knauf-fire-panel-square-edge-foil-backed-plasterboard#:~:text=Knauf%20Fire%20Panel%20plasterboard%20offers,resistance%2C%20meeting%20high%20safety%20standards>. Accessed on 16/01/25
- 13. Steel protection (no date). <https://www.british-gypsum.com/specification/white-book-specification-selector/steel-protection>. Accessed on 16/01/25

- 14.Mli (2022) 'Benefits and drawbacks of uPVC windows and doors - MLI Building Products,' MLI Building Products LTD, 3 May. <https://www.mlibuildingproducts.co.uk/blog/benefits-drawbacks-upvc-windows/>.Accessed on 16/01/25
- 15.Coming soon | Aeon GB Ltd (2023). <https://www.aeongb.co.uk/525-2/>. Accessed on 16/01/25 (This is to show what company I would use to survey)
- 16.
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