

Module: Fundamentals of Construction Technology

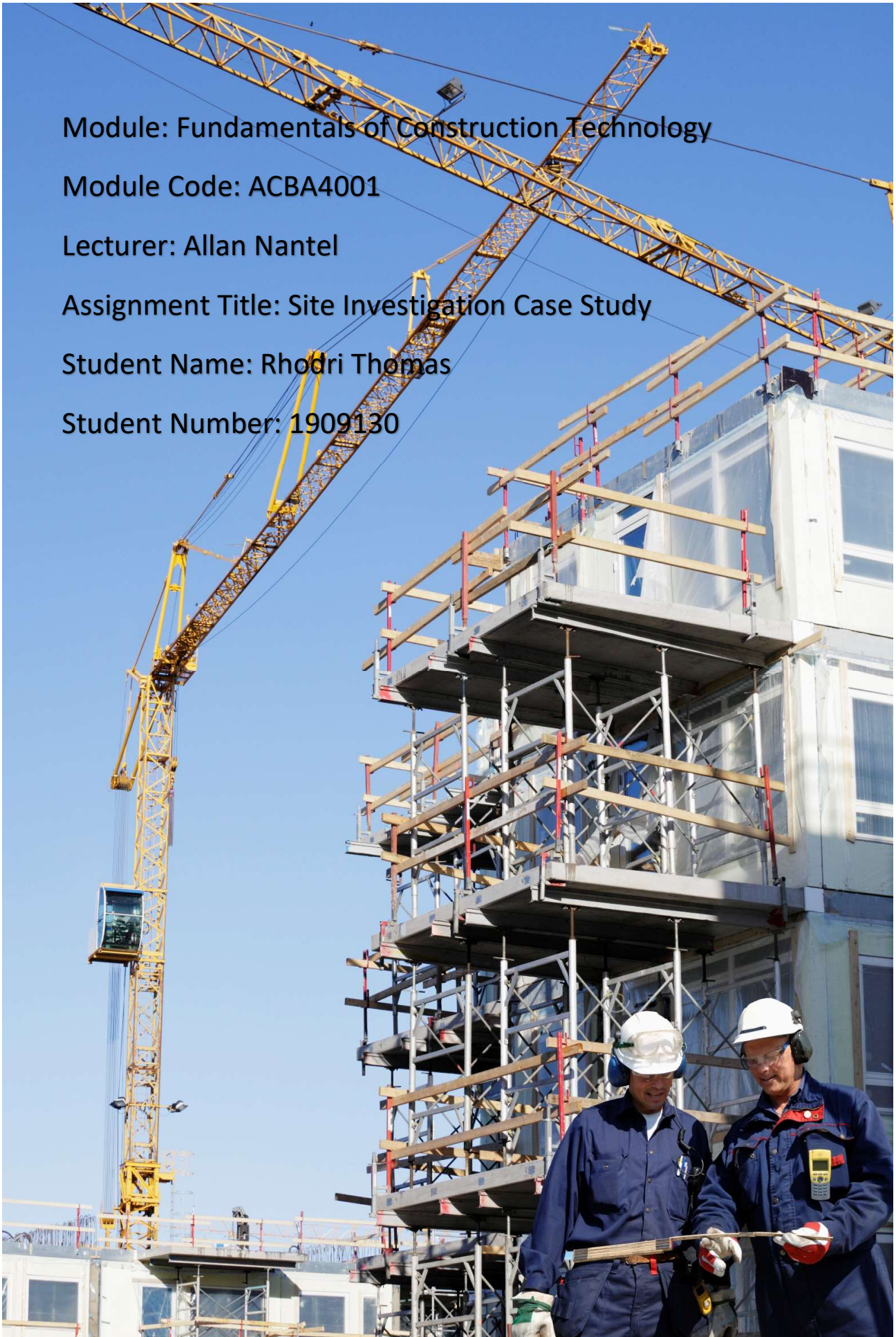
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Assignment Title: Site Investigation Case Study

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Assignment brief and Introduction– overview of tasks.

In my role as a Junior construction professional working for a local company, I have been asked to produce a full site investigation for the construction of a new restaurant and ice cream parlour on Swansea foreshore.

Task 1 - Describe the historical background of the site via a preliminary desktop study, drawing upon archival material. Your study should include plans and photographs, with full referencing of both illustration and archival information gained.

1.1 Purpose of desktop Survey

The purpose of this desktop survey is to find information such as the historical background of the site, geological data, local site and its current uses, surrounding area, services and site limits. This is done by looking into historical drawings and archival material.

This report will also provide recommendations on intrusive and non-intrusive investigations to be undertaken along with recommendations for possible foundation designs for the proposed project.

Digimaps (Digimap.edina.ac.uk) search of site location which includes the following key areas –

Geological data.

Historical photographs from 1880 -1980

Current Ordinance Survey maps.

A visit was also made to Swansea library to view archival maps.

1.2 Site description

The proposed development site is located between County Hall and Marriott's Hotel and will form part of the existing car park that is currently being used by customers of both County Hall and Marriott's Hotel. A public coastal footpath is located South of development site and next to beach/foreshore area. Access by vehicles is only possible via access roads to County Hall and Marriott's car parking areas. There are currently a few small buildings (data taken from OS maps) on proposed development area and a footpath (North/South Direction). Swansea marina is located approximately 500 yards in an easterly direction. The existing land is a mix of tarmac and lawned areas. The national grid reference of the site is SS654922 (Grid Reference Finder, 2019). The postcode for Marriott's Hotel is SA1 3SS.

The proposed development will include a new restaurant and ice cream parlour at ground floor level with mangers apartment at 1st floor.



Figure 1 – Proposed site location (Google Maps, 2019)

1.3 Site History to Inc. Green field/ Brown field/Planning Inc. current planning.

Observation of Digimap's data and Ordnance Survey maps at Swansea library over a period from 1880 to 1980 shows a varied use over this period for proposed development site



Figure 2 – Historic map 1880 (Digimap, 2019)

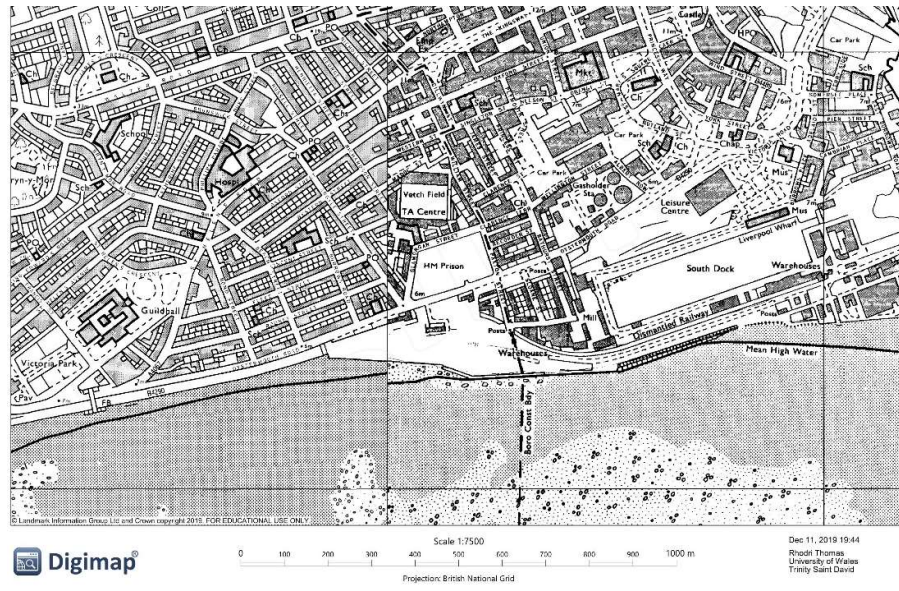


Figure 3 – Historic map 1970. Train track removed (Digimap, 2019)

The 1880-1960 historical maps show a railway track passing through the development site. The railway track use was removed sometime between 1960 and 1970 as archive map dated 1970 states 'Dismantled railway' South of South Dock. The site area has had multiple industrial use between 1880 and 1980 –

- 1880 – Hospital
- 1900 to 1960 – Trains engine shed, canister works, Timber yards, Paint factory and allotment gardens.
- 1970 – Warehouses
- 1980 – Vacant with county hall in Westerly direction.

All maps between 1880 and 1970 show gas works located approximately 800 meters in a North Easterly direction from proposed development area.

Planning history

Swansea City council Planning Map search (Swansea City Council - Planning Application Search, 2019) (Ref 2011/0018) provides details of shared use footway/cycle way between Dunvant Place and foreshore. The footpath position passes over the development site in a North/South direction. Historical planning data (Swansea City Council - Planning Application Search, 2019) confirms that there are no other on-site development applications since 2000. As previously mentioned, there are a few small buildings which may impact on proposal and will require further investigation.

1.4 Ordnance Survey Map – Bombing 1943.

A large area of Swansea was bombed during World War 2 although we are unable to find records of bombing for this particular site.



Figure 4 – Extent of bombing area in Swansea during World War 2 (Alban, 1994)

1.5 Geological maps and Published Geology and sub soil type/Landfill.

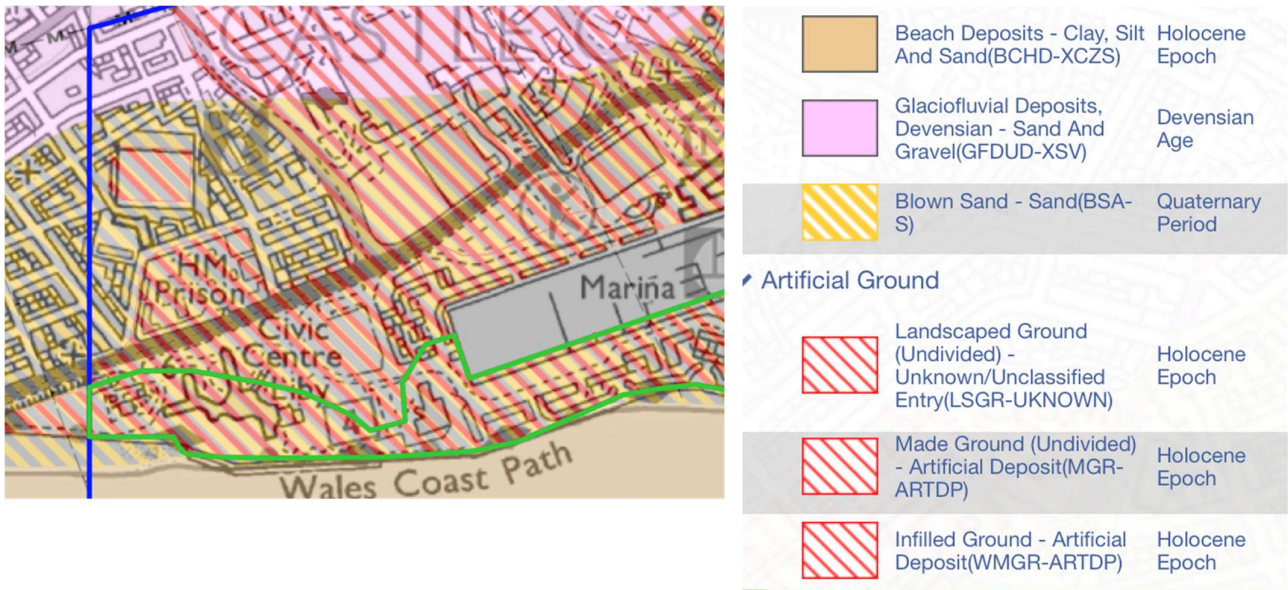


Figure 5 – Geological and published geology (Digimap, 2019)

As can be seen in figure 5, the published geology for development site is a mix of blown sand – Sand (BSA-S) of the Quaternary period and made ground (undivided) – artificial deposit (MGR-ARTDP) of Holocene Epoch.

1.6 Radon gas risk

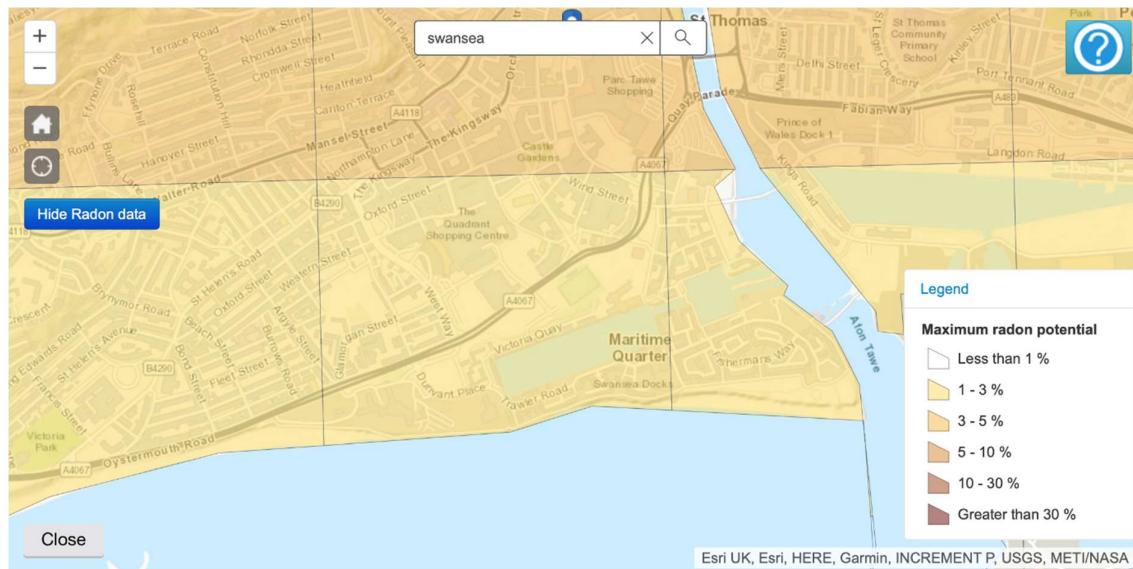


Figure 6 – Radon map and maximum radon potential (UKradon, 2019)

The UKradon website confirms that the maximum radon potential for development site is 1- 3%.

1.7 Local environment/flora/fauna

Enquiries made to Swansea City Council planning department has confirmed that there are no Tree Preservation Orders (TPO's) on or within close proximity of proposed development site. The tarmac and short grass nature of site suggests that there is low potential for flora or fauna of significant interest. However, there are some young trees on site.

1.8 Flood risk



Figure 7 – Flood risk development advice map (Flood Risk Development Advice Map, 2019)

The development advice map from Natural Resources Wales confirm that the development site is located within Zone A – ‘Considered to be at little or no risk of fluvial or coastal/tidal flooding’.

Task 2 - Describe, given the historic background, your **recommendations** for the contents of a detailed site investigation, which is to be undertaken by others. You must advise them of which elements of the site investigation you consider being most significant and applicable to this particular site, given its historic background.

Further to the completion of desktop survey in task 1, the author recommends the following detailed site investigation -

2.1 Full Utilities mapping requests/ CAT scanning.

The initial desktop survey was unable to identify utility services located within development site and therefore further investigation through contacting relevant utility companies or data provider. In order to comply with current Health and Safety Executive (Health and Safety Executive, 2019) and The Construction (Design and Management) Regulations 2015 (Construction Design and Management Regulations 2015, 2015) requirements on site checks also need to be undertaken via CAT scanning in order to establish exact location of any utilities that may pass through the site.

2.2 Full detailed ground investigation Trial pits and bore holes for establishing geology data

The desktop survey identified several potential ground issues which need to be further investigated in order to establish onsite geology data which will inform foundation design for proposed development –

- Compaction of ground due to rail track use/heavy machinery over several years.
- Mixed industrial use which may have also contributed to different levels of ground settlement levels.
- Geological data confirming a mix of blown sand and made ground.
- Potential disturbed land due to proximity of bombing in Swansea during World War 2.

The above data needs to be compiled through a full on site ground investigation which will include trial pits close to foundation areas of proposed building. Bore hole sampling of soil to collect different types of ground material at different levels and ground water levels due to being near to marina and adjacent sea. The full ground investigation will need to comply with the following British Standard/Codes of Practice –

(BS 5390:2015 Code of Practice for Ground Investigations, 2015)

2.3 Environmental and land contamination

The Brownfield nature of the site, several mixed industrial use over several years and other areas near to site along with made ground nature of the site may result in a high risk of land contamination. The site will require further investigation that complies with the following British Standard/Code of Practice –

(BS 10175:2011 + A2:2017 Investigation of Potentially Contaminated Sites, 2017)

(BS EN ISO 16133:2018 Soil Quality - guidance on the establishment and maintenance of monitoring programmes, 2018)

2.4 Ecological survey

Although the desktop survey found low potential impact from flora or fauna, the author recommends further investigation into potential below ground fauna use in order to find out project risks relating to this key area. Ecology survey to comply with the following published data –

(BS42020:2013 Biodiversity Code of Practice in Planning and Development, 2013)

2.5 Footpath

The footpath approved by Swansea City Council under application Ref 2011/0018 (Swansea City Council - Planning Application Search, 2019) will need to be diverted in order to accommodate proposed building. Consultation will need to be undertaken with the authority to find out procedures for the relocation of this footpath.

Task 3 - State the Building Regulations / Codes of Practice from which your recommendations are derived.

3.1 Building Regulations Approved Document Part A – Structural Safety

Approved documents provide technical guidance on minimum standards for a variety of common building situations and construction elements in order to comply with the building act and building regulations. Foundations are covered within Approved document A: Section 2E: Foundations of plain concrete. However, the guidance states (Approved Document A - Structural Safety , 2004) –

“There should not be: (a) non-engineered fill (as described in BRE Digest 427) or wide variation in ground conditions within the loaded area; nor (b) weaker or more compressible ground at such a depth below the foundation as could impair the stability of the structure”

Due to the information gathered during desktop survey, the guidance within the document confirms that Approved document A cannot be used for proposed structure.

3.2 BS 8004:2015 Code of practice for Foundations

This document provides guidance on both shallow and deep foundation to include pile foundations.

3.3 LABC Warranty Technical Manual version 8

Chapter 5 provides guidance on the design and installation of Piled and Raft Foundations.

3.4 BS 10175:2011 + A2:2017 Investigation of Potentially Contaminated Sites.

Code of practice for investigating land that may contain harmful chemicals at proposed development site.

3.5 BS 5930:2015 Code of Practice for Ground Investigations.

Code of practice for ground investigations. Compliance required to ensure correct foundations design is selected for proposed building.

3.6 BS EN ISO 16133: Soil Quality – guidance on the establishment and maintenance of monitoring programmes.

Monitoring procedures if contamination is found on site.

Task 4 - With the aid of sketches, describe a suitable foundation detail for the building, based on your preliminary observations.

4.1 Foundation options

The proposed 2 storey building will require a foundation that will be able to sustain full structure weight on ground condition data that will be known once key areas identified in task 2 will be identified. Initial desktop site investigation data and guidance found within Approved document A of the Building Regulations has already ruled out the use of strip foundations. It is therefore proposed, subject to detailed site investigation/soil data, bearing capacity and full engineers' details and calculations that the most appropriate foundation for the site is either Pile foundations or Raft foundations.

4.2 Pile foundations

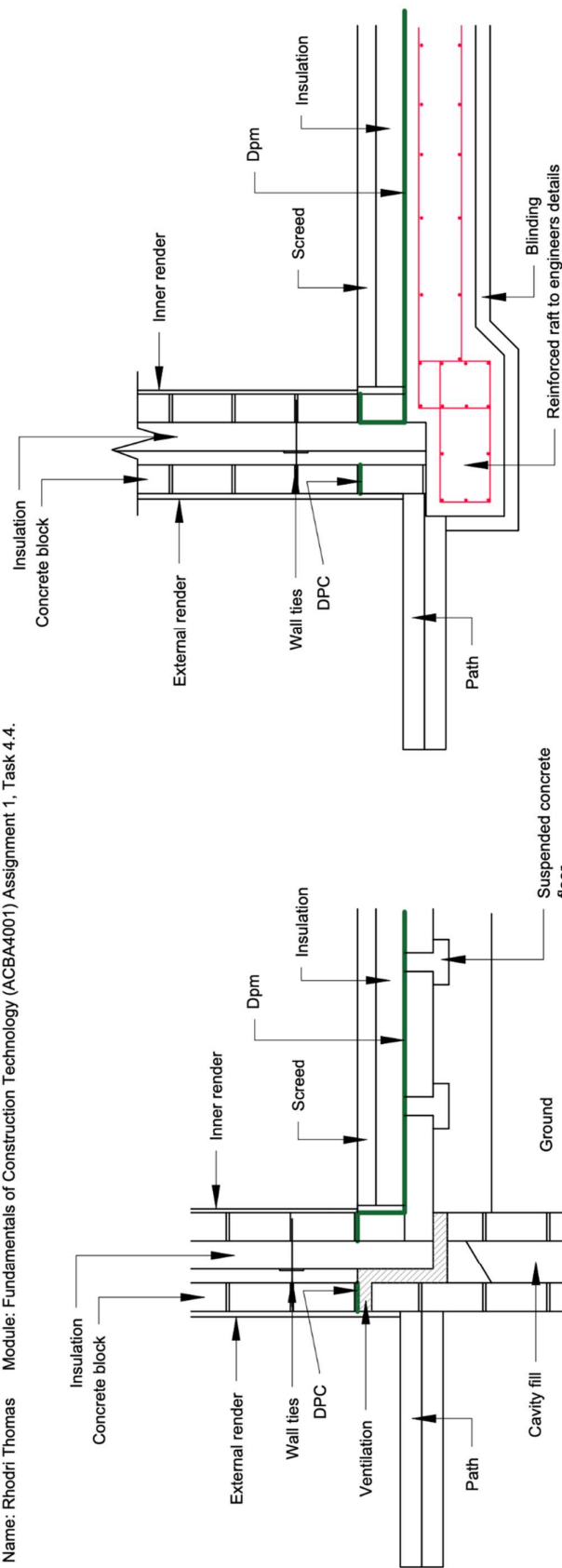
Pile foundations are a series of concrete columns that are driven into the ground until a certain designed resistance is achieved or they can also be poured in situ with reinforcement. The piles are designed by engineers and form a grid to perimeter and intersecting walls. The piles are then capped with reinforced concrete ground beams which are cast in situ. See example of pile foundation detail drawing in section 4.4.

4.3 Raft foundations

Raft foundations are suitable for buildings with light loadings and where ground conditions of poor soils are present along with issues of bearing capacity. Raft foundations are cast in situ, will include substantial reinforcement and fully designed by structural engineer. Rafts spread loads over a large area. See example of raft foundation detail in section 4.4

4.4 – Sketch details of typical Pile and Raft Foundations.

Name: Rhodri Thomas Module: Fundamentals of Construction Technology (ACBA4001) Assignment 1, Task 4.4.



TYPICAL PILE FOUNDATION DETAIL

TYPICAL RAFT FOUNDATION DETAIL

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