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Module code: ACBA4001
Lecturer: Gavin Traylor
Assignment title: New Build Dwelling: Technical report with drawings

1. i) Clearly define the term Offsite Construction.

The process of finishing different parts or components of a building project at a place different from where they will eventually be installed permanently is referred to as “offsite construction”. This method includes all stages of construction, which are frequently completed in specialised off-site factories or facilities, including planning, design, fabrication and assembly.

Construction companies may improve productivity throughout the project, guaranteeing quality control and accelerate manufacturing through the use of purpose-built offsite facilities. After the parts are finished being manufactured and put together, they are sent to the construction site and put in place where they are supposed to be. There are many advantages to this strategy, such as shorter construction times, less disturbances on the job site, better safety, and more accuracy in the construction process.

Offsite construction has become a cutting-edge method of building that solves the problems associated with traditional on-site construction and provides an answer for more sustainability and productivity in the construction sector.

Although offsite construction is more commonly linked with permanent structures, it can also be used, although less frequently, with temporary or relocatable structures. Offsite construction techniques offer efficiency and quality control that are particularly advantageous for permanent constructions, including residential dwellings, commercial buildings, and infrastructure projects. Offsite construction can often be used for temporary buildings like modular classrooms or makeshift homes in disaster-affected areas.

Offsite construction techniques provide many benefits, including shorter construction timeframes, less waste, better quality control, and increased sustainability, regardless of whether the structures are temporary or permanent. These techniques are fostering innovation and efficiency in building processes as they persist in developing and gaining popularity in many sectors of the construction industry.

Offsite construction is especially useful for repetitive, high-volume parts that need to be produced in a factory to meet quality standards. Most people agree that the obvious goal of offsite construction should be for housing.

However, some disadvantages of offsite construction are that it can be costly to set up initially to be able to accommodate assembly line production and may be challenging to have a steady enough demand flow. Transport expenses can also be substantial.

Furthermore, there have been persistent worries about the term “prefabricated” due to the low-quality mass-produced housing that was prefabricated after World War II.

(Designingbuildings.co.uk, 2017)

(Ferng, n.d.)

(Hardiman - Williams LLC, n.d.)

(Team, 2022)

ii) Describe the four main categories of offsite construction giving an example of how each method could be incorporated into the proposed house.

There are four main categories of offsite construction which are:

1. Volumetric modular construction
2. Panelised systems
3. Hybrid construction
4. Sub-assemblies and accessories systems

1. Volumetric modular construction

Volumetric construction is when whole rooms or parts of a building are built offsite as complete modules or volumetric units in volumetric modular construction. Usually, these modules are completely furnished in factory-controlled settings with fixtures, fittings, and finishes. After they are finished, they are brought to the building site where they are put together to form the finished structure. This approach has benefits like less site disturbance, enhanced quality control, and shorter on-site building times. This type of construction can be made from timber, concrete or light gauge steel frames. Volumetric construction can be divided into two parts, which are modular construction and pod construction.

Modular construction are pre-engineered building components manufactured in a factory which are transported to the construction site. Following that, these modules are put together as substantial elements or big volumetric components.

Pod construction is when non-structural components called pods are utilised together with load bearing structures. They are most commonly used in the hotel and accommodation building industry. The pod may consist of a load-bearing structure, a steel frame, a concrete frame or timber frame.

An example of how this method could be incorporated into the proposed house is by using bathroom pods. Complete bathroom pods, including plumbing and electrical systems, are produced offsite. They come with all the fixtures, fittings and finishes already installed. The time and complexity of onsite building can be decreased by bringing these modules to the location and integrating them into the house.

2. Panelised systems

Panelised systems entail the offsite production of individual panels or sections that make up building components like floors, roofs, and walls. After being prefabricated with finishes,

insulation, and structural components, these panels are sent to the construction site and assembled there. Because panelised construction uses integrated insulation, it offers improved thermal performance, more design freedom, and economical material use. It also makes onsite assembly faster, which helps reduce construction schedules.

Panelised systems could be used in the proposed house by offsite manufacturing which is used to create timber frame panels with integrated woodfibre blown insulation. Insulation is positioned between the inner and outer skins of these panels. These panels are put up and put together at the building site to make the house's walls and floors.

3. Hybrid construction

By combining traditional building processes with offsite and onsite construction techniques, hybrid construction takes advantage of prefabrication's advantages. With this method, building components or structural frameworks can be prefabricated offsite, while other parts can be built onsite. The benefits of both onsite and offsite construction techniques are combined in hybrid construction, which includes increased construction speed, quality control, and customisation possibilities.

An example of using this method would be by using prefabricated structural steel frames, which are then transported to the construction site. After that, the steel frames are assembled and combined with additional structural elements like concrete slabs and wood panels, combining the flexibility of onsite construction with the speed and efficiency of offsite fabrication.

4. Sub-assemblies and Components

The offsite manufacture of individual building elements, such as windows, doors, staircases, and other architectural features, is referred to as sub-assemblies and components. These components are manufactured with accuracy and quality control procedures in a factory before being transported to the building site and installed. Prefabricated components and sub-assemblies guarantee consistency in quality and performance, expedite the building process, and lower the amount of labour needed on the job site. They also give the construction project more possibilities for customisation and design flexibility.

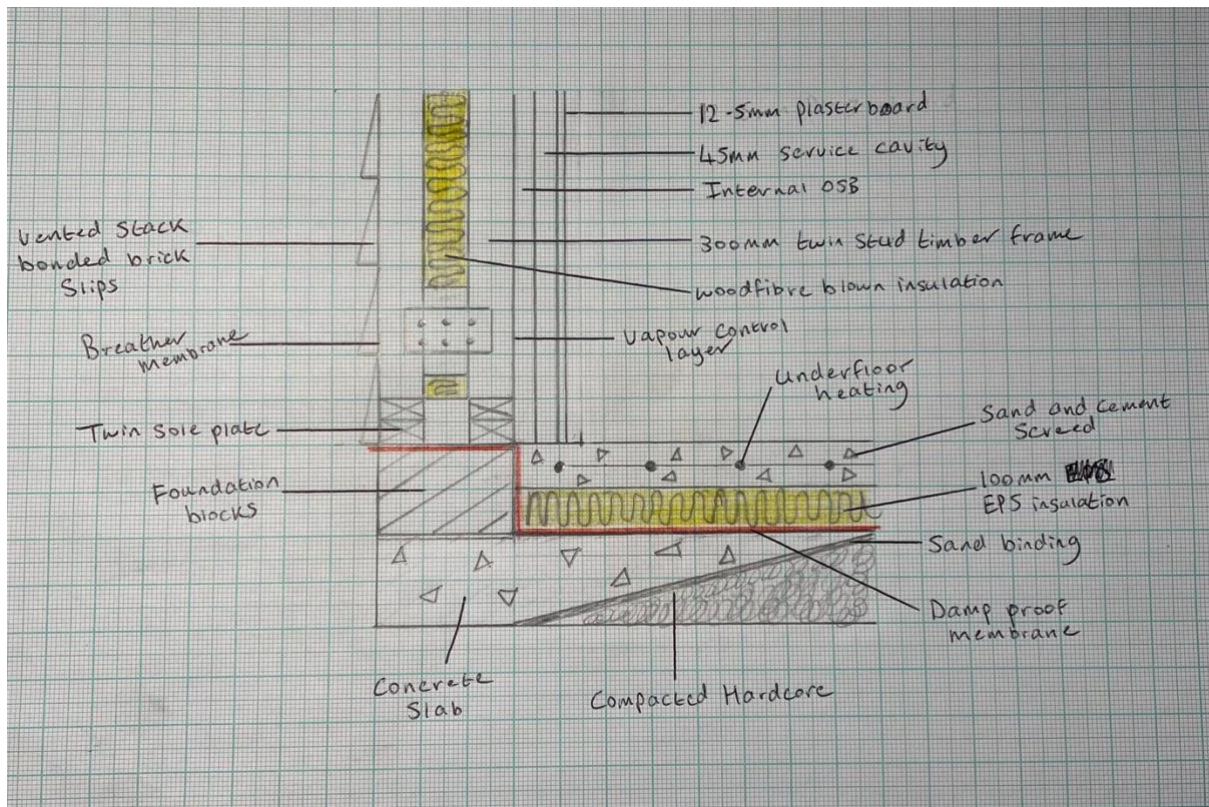
The sub-assemblies and components method could be incorporated into the proposed house by offsite manufacturing of factory made triple glazed windows. These window assemblies come pre-assembled at the construction site, complete with frames and glazing. Likewise, triple glazed external doors with wooden frames can be prefabricated offsite and assembled as full components onsite.

(The Constructor, 2020)

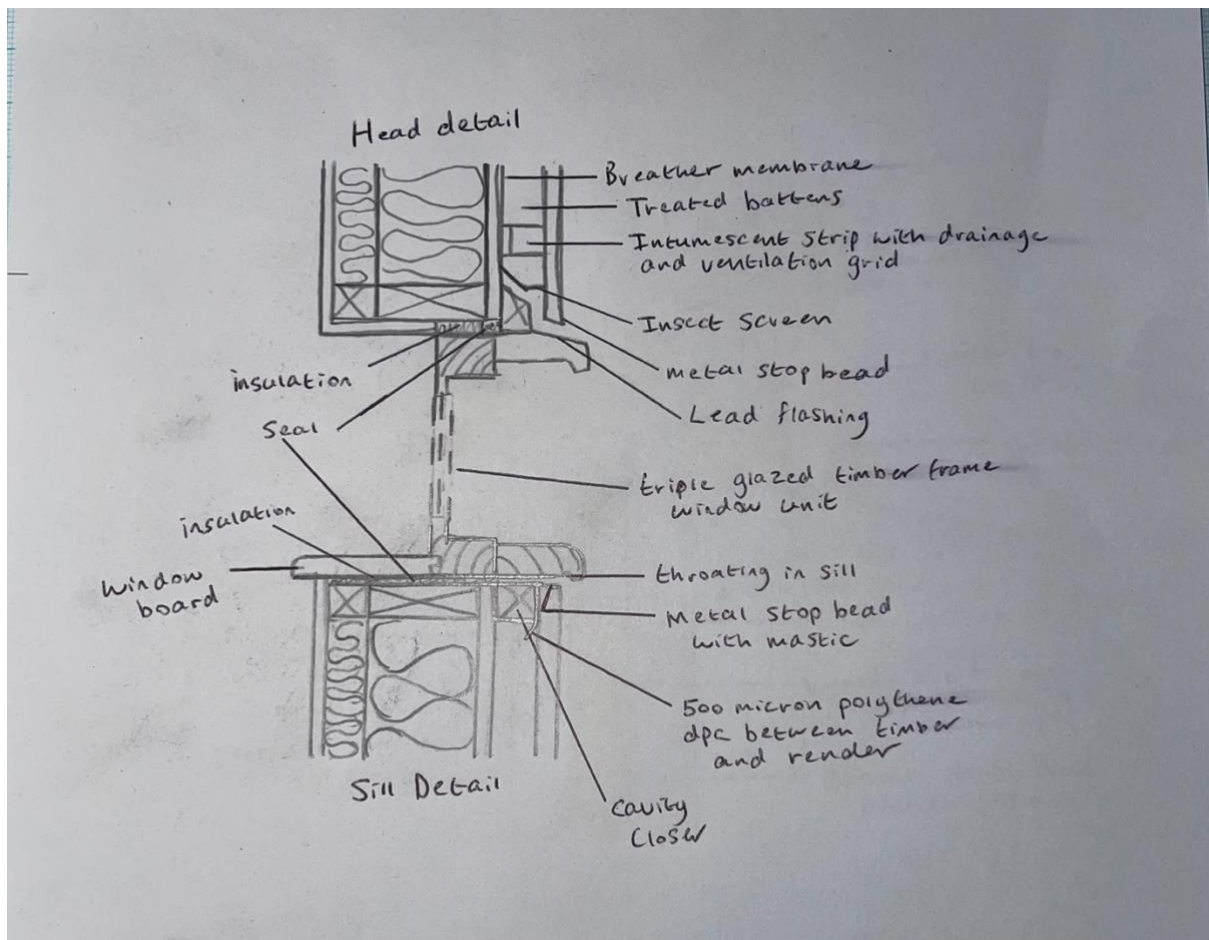
(Miles, 2019)

(Riddell, 2021)

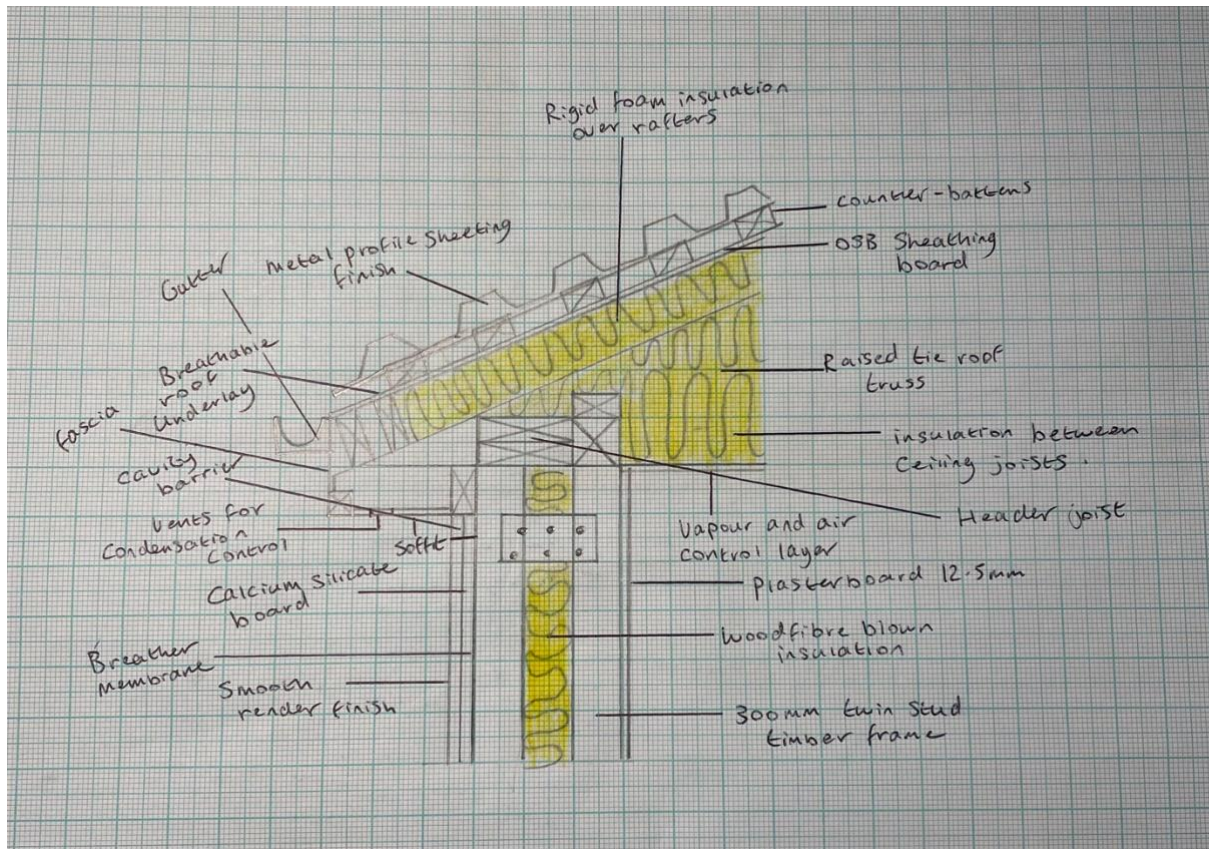
2. i) The ground floor construction, detailing and junctions with external walls.



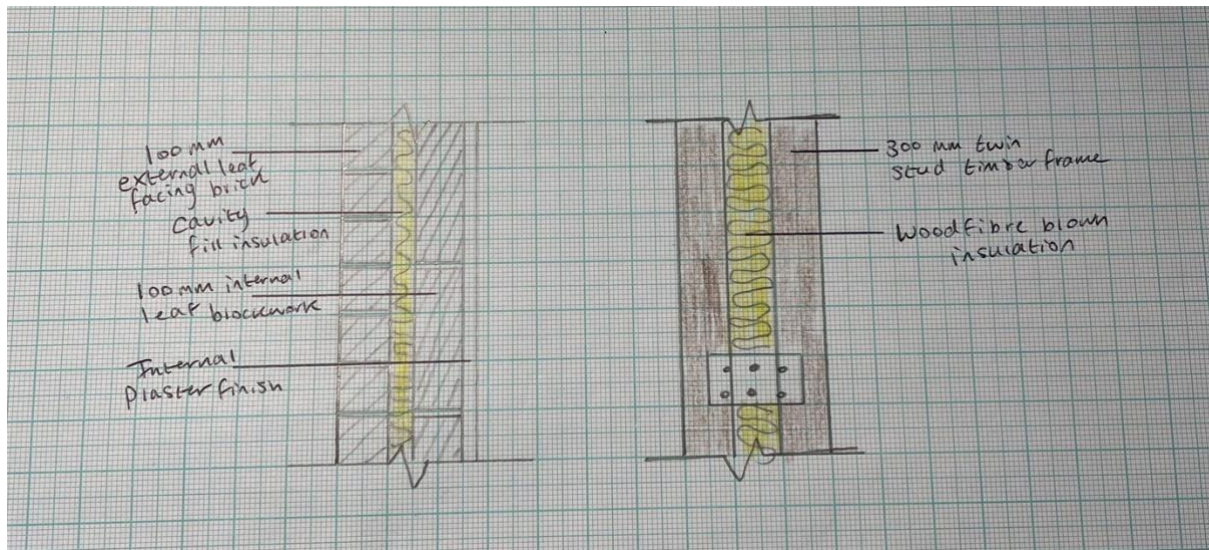
ii) A detailed section and plan showing a window opening in the external wall.



iii) Eaves detailing & main roof structure – indicating appropriate weathering, fixing and laps.



3. The client wishes to compare the wall construction of brick and block v's the new proposed construction. Draw a typical wall section for each making comparisons on thickness, thermal performance and structure.



In general, brick and block walls are thicker than timber-framed walls. The amount of mortar joints, extra insulating layers, and the number of brick and block layers utilised can all affect the thickness. The thickness of a typical brick wall might range from 215mm to 300mm or more.

Because timber frame walls employ timber studs or panels, they are often thinner than brick and block walls. The thickness varies according to the size and spacing of the studs, but in residential construction, it usually ranges from 89 to 140mm. To improve thermal performance without considerably thickening the wall, more insulation might be placed inside the wall cavity.

Brick and block walls slowly absorb and release heat, means they have high thermal mass qualities that can help regulate inside temperatures. In contrast to wood frame walls, brick and block walls could perform less thermally overall if more insulation isn't added. External insulation or cavity insulation can be added to improve thermal performance, however doing so may result in thicker walls.

As timber frame walls can include a large amount of insulation in the wall cavity, they have greater thermal performance. For increased thermal efficiency, insulating materials like mineral wool or foam board can be inserted into the spaces between wood studs. In addition to reducing thermal bridging that can happen with brick and block walls, timber frame construction also improves energy efficiency and lowers heat expenses.

Block and brick walls are load-bearing constructions, meaning they transfer loads to the foundation and support the weight of the building. In order to build a sturdy and long-lasting structure, brick and blocks are laid in mortar. Great reinforcement could be needed for larger openings such as doors and windows.

Timber studs or panels are used to build timber-framed walls because they are lightweights and easy to move. Unlike brick and block building, load-bearing timber frame construction transfers the load to the base through an independent structural frame or support system. Faster construction timelines and more design freedom are made possible by the off-site construction and on-site assembly of timber frame walls.

Overall, there are benefits and factors to be taken into account while building brick and block walls as well as timber frames with regard to thickness, thermal performance and structure. The decision between the two approaches is frequently influence by elements including client preferences, local climate conditions, building design, and legal constraints.

(Maxwell, 2023)

(sarah@besmartmedia.com, 2022)

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