

Clearly define the term Offsite Construction. (5%) ii)

The term off site construction, also known as modular construction or prefabrication refers to the process of manufacturing building components prior to them arriving at site. These prefabricated components are sent to building sites just in time for when they need to be installed, like an assembly line. An efficient and correctly working assembly line has multiple benefits to the construction process, some of these include quality control and greater efficiency, with addition to this there is better consistency when compared to the traditional onsite construction methods, due to a more intense quality control check of the materials before being sent to site. Moreover there can be many obstacles presented while working on site, such as space to construct and also storage space, tools required and timeframes allowed. By overlapping manufacturing and site preparation, this extremely increases the pace of the construction, also the cost is increased as labour costs are decreased. When modular construction methods are not used then there are usually many factors which can cause an increase of construction costs to the customer, there are many reasons for this such as increased labour costs due to the site not being the perfect environment to construct certain items whereas they would be in a warehouse specifically made for that reason, also there is usually a lot of error on site with material deliveries, space, weather etc which all pose as a risk to the erection of certain items. For example a prefabricated staircase can be put in place immediately when it arrives on site, however to construct this on site would require a large working space, little interruption from other trades and if it had to be erected outside the weather would also have to be suitable.

Describe the four main categories of offsite construction giving an example of how each method could be incorporated into the proposed house. (10%)

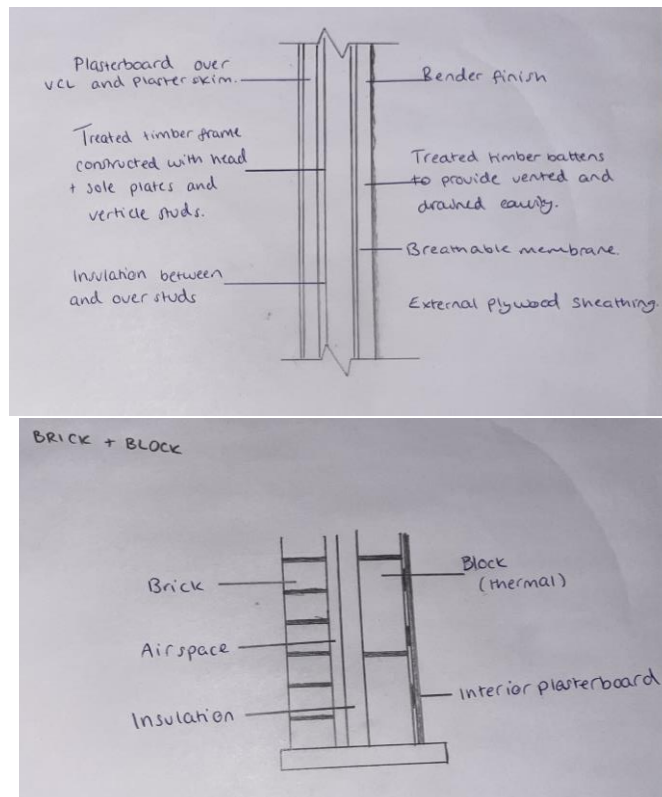
There are four main categories of offsite construction, for example volumetric construction, a type of off-site construction where structures are assembled by joining several sizable, prefabricated sections, or "modules," together. This means entire rooms can be prefabricated such as bathrooms or bedrooms before they arrive to the construction site. These can then be quickly assembled on site when they are delivered, this will require minimal work and tradespeople required, resulting in less labour costs on site and also no room for error while on site as they have been prefabricated, also resulting with better time efficiency as the material is on site and there will be reduced errors during the build. Volumetric construction methods can be incorporated into the proposed house as Timber frame construction lends itself well to this construction method due to its lightweight nature and ease of prefabrication. The timber frame structure could be prefabricated into modular panels off site then brought onto site to be quickly installed.

Another method of offsite construction is panelized construction, which consists of wall panels, floor panels, and roof trusses being prefabricated in a controlled factory setting and then later transported to site where they will be put into place by cranes or other means of lifting equipment. This method of offsite construction saves a great deal of time when compared to traditional on-site methods of construction. In addition to this, Panelized construction retains the advantages of factory-based production and quality control while providing design and customisation flexibility. Furthermore, the modular construction method consists of Complete building modules or units are fabricated in a factory setting, these modules once completed can come completed with interior finishes, fixtures and fittings. Modular construction can be extremely beneficial to larger projects which require consistency within, such as hotels, hospitals or schools. Quicker construction schedules, better quality control, and less onsite labour requirements are some of the benefits that modular construction presents. This method could be used on the proposed house as not only the panels but also studs, sheathing insulation and cladding can all be prefabricated offsite then be brought to site for a quick and easy installation. However transporting the panels could be an issue as this could potentially require the use of cranes or other means of heavy machinery which can pose as another issue as they may not be easily accessible to the site as it was previously agricultural land which could mean limited transportation access to the jobsite.

In addition to this there are hybrid systems, To maximise the benefits of each strategy, hybrid construction systems incorporate elements of all traditional on-site and off-site construction techniques. By adapting both construction techniques this method facilitates a construction process that is more versatile and adaptable to the specific needs of a given project. This also allows for improvements on cost effectiveness and flexibility. Hybrid systems are used often by larger industrial projects such as healthcare buildings and commercial developments due to their flexibility. An example of how this construction method could be utilised on this proposed build is that wall panels could be prefabricated and brought onto site to then be incorporated with on site built roof trusses. Although this method does require more skilled tradesmen to produce items such as the roof trusses in order to produce a high standard of work as there is no longer the quality checks there would be in a factory.

Finally, the last modern offsite construction method is sub- assembly construction. This method of construction consists of prefabricating smaller assemblies or prefabricating whole plumbing or electrical systems so that they can then just be inserted into the build when they arrive to the jobsite. An example for where this is often used is industrial buildings where a lot of the build is going to be identical so it would be easier to prefabricate things such as bathroom pods or kitchen pods which are constructed offsite including plumbing and electrical fixtures, these pods can then be brought on to site by the means of cranes for a quick installation. This method of modular construction may not be suitable for the proposed build as the land used to be agricultural land which suggests there may not be suitable access for a crane. Also this method could be more time consuming than just getting plumbers and electricians to site which adds to cost.

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. (25%)



These two methods of wall construction both have their differing strengths and weaknesses but prior to deciding which method to use it is important to understand where each type of wall construction would be best suited and there are many important factors to take into consideration. Selecting to build a certain type of wall can pose as a costly decision to make and time consuming, starting a project with the wrong wall type could lengthen the construction time.

When deciding what wall type to choose it is essential to look into the structural considerations of the build, this includes what is the load bearing capacity. If a build was expected to have a high downward weight then it may be best to build the walls out of brick and block this is due to their high compressive strength which makes them capable of bearing heavy loads. In addition to this another benefits of the characteristics of brick and block is that they are extremely durable therefore they will do well to protect the property from fire, pests and resists well to weathering and potential environmental forces. Again due to the properties of brick and block being dense they also provide the benefits of having a high thermal mass which means that they absorb and store heat which also helps to regulate the indoor temperatures resulting in reducing energy

costs. While brick and block walls can be insulated, the insulation is typically installed as an additional layer on the interior or exterior of the wall. The thermal performance of timber frame walls compared to brick and block walls depends on various factors, including insulation, thermal mass, and air tightness. Timber frame walls typically offer better thermal performance compared to traditional brick and block walls due to their ability to accommodate higher levels of insulation and minimize thermal bridging. Brick and block walls may be more prone to air leakage compared to timber frame walls, especially if mortar joints or wall ties are not properly sealed.

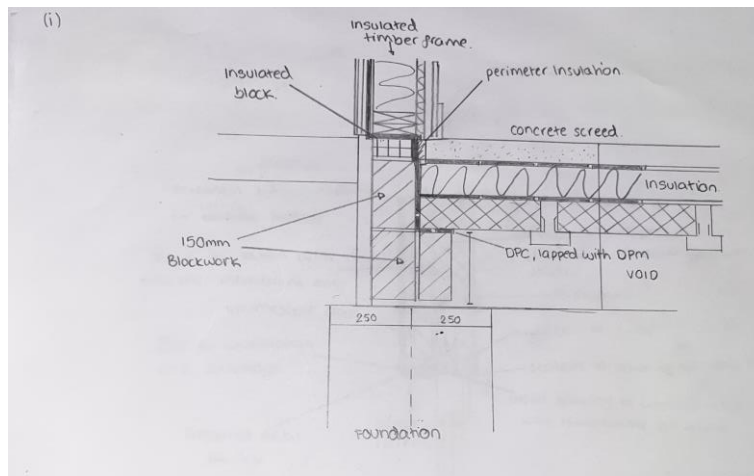
As brick and block are dense it means that they provide efficient sound insulation which also benefits reducing noise transmitting from between rooms or from outside. In comparison to this, timber panelled walls are often lightweight which can be advantageous such as building in poor soil conditions or simply making additions to already existing builds, however here it means that there would need to be extra soundproofing which can be done with soundproof boards but with thermal conductivity, within the wall structure insulation is placed so they can do well with retaining heat which again does reduce heating costs.

Furthermore, brick and block walls typically have a long lifespan and require little maintenance. However the initial construction of brick and block walls can be a long process. During planning, the location and time the build will take place needs to be inspected, this is as if the client wishes to have brick and block then the rest of the build needs to be arranged around when the walls can go in, the weather for when laying brick and block takes place needs to be the correct conditions. This is because the weather can affect the way the mortar cures and can do well at removing the strength from the build. This can pose as extremely cost effective as if any issues arise with the weather then the build can be postponed for weeks, costing the building firm and customer money. In contrast to this, timber panelled walls are often chosen due to their versatility as they can be built around what is existing and they can be customised to accommodate different architectural styles. Also there is simplicity with construction, Timber panelled walls can be built at any time of the year and during most weather conditions meaning time to be less of an issue than when installing brick and block resulting in other trades being able to get into the site quicker and resulting in the build being a lot faster. The general time it takes to build a brick and block wall can be extremely time consuming as it is a slow process making the correct mixes and the time it takes to lay the bricks and blocks to standard and with taking consideration to regulations. In addition to this it is important to get a skilled tradesperson to provide an efficient bond pattern in order to evenly distribute loads and to provide stability to the walls which again can be very time consuming ultimately resulting in higher costs. On the other hand, timber panel construction methods are often a lot faster, also other working practices such as modular construction can be incorporated into the build when using timber panelled walls, for example the wall panels could be prefabricated off site then brought to site for a quick and easy installation. Also the brick and block walls would then need to be weatherproofed against moisture and water damage, this could be done using sealants or waterproofing membranes. On the other hand the alternative method of building walls, timber construction is much more environmentally friendly than brick and block this is due to timber being a renewable resource and brick and block requiring much

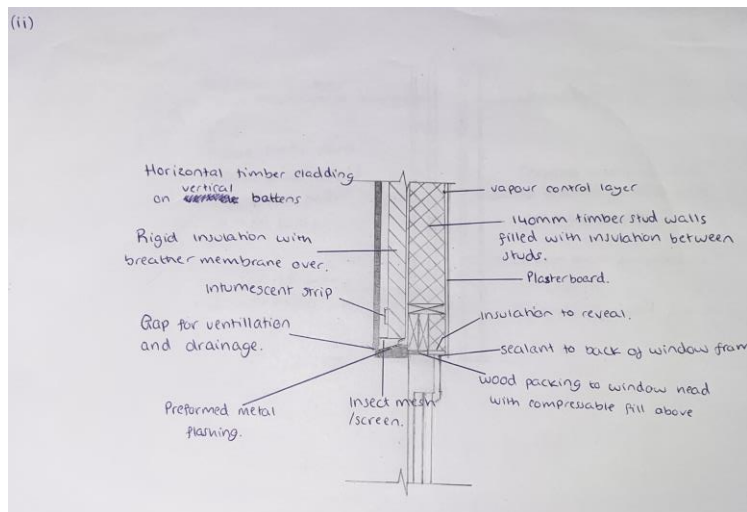
more energy-intensive manufacturing processes. Finally, to choose between these proposed options for building walls then multiple factors need to be taken into consideration and inspected first, also building codes and regulations will also have a role in dictating the material and construction methods that can be used for the area of the build, it is important to contact the correct authorities when planning a project.

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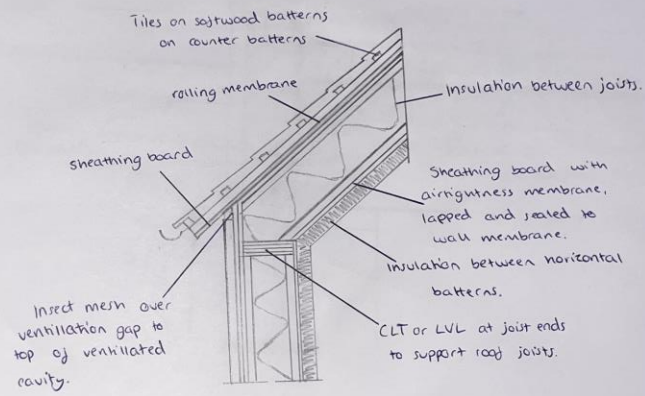
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