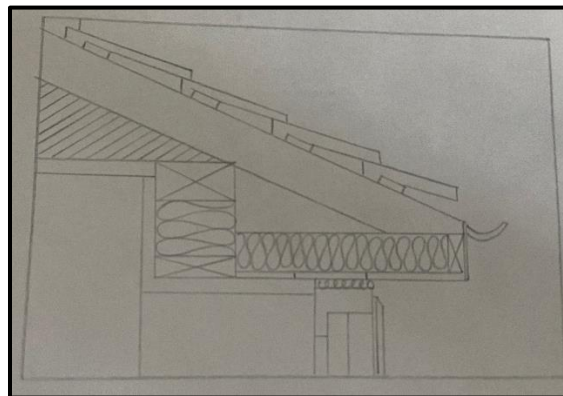


Construction Detailing : Two Storey Detached Domestic Building



[1824 Words]

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Construction Detailing – Two Storey Detached Domestic Building

Introduction :

Task Brief

For this task, I am to assumed that a major property developer has received planning permission for a single, two storey detached domestic building with a loft room. My input to the development is to solve a series of construction details for the build, concerning the following:

- The Ground Floor
- The First Floor
- Openings
- Eaves Detailing and Roof Covering
- The Main Roof Structure

I will complete this task by illustrating my solutions through annotated drawings and concepts, with all elements being labelled and explained. Additionally, I will identify any materials and methods used where applicable.

Specification as per 'Task Description':

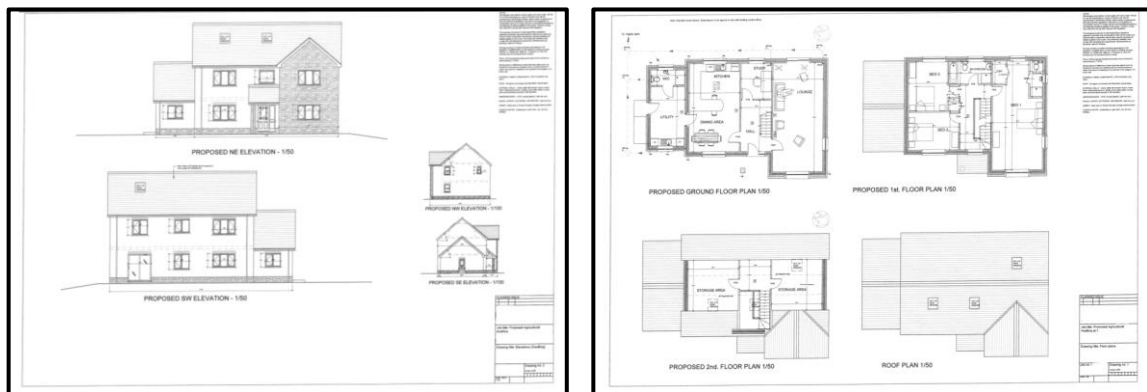
It is to be built on a level, greenfield site that has 450mm of topsoil above a firm subsoil with a low clay content that is above the water table.

The building is of standard cavity wall construction; block and block with partial fill cavity insulation and a smooth render externally. Plinths soldier courses over all openings and porch pillars are to be natural sandstone.

There is a suspended timber ground floor and upper floors are to be traditional solid timber with tongue and groove softwood flooring.

Windows and external doors are to be light oak effect uPVC with sealed Double-glazed unit.

Roof structure is to be trussed rafters at a 40° pitch with a natural slate covering and closed eaves. The roof covering is to be natural slates.



Construction Detailing – Two Storey Detached Domestic Building

Construction Detailing :

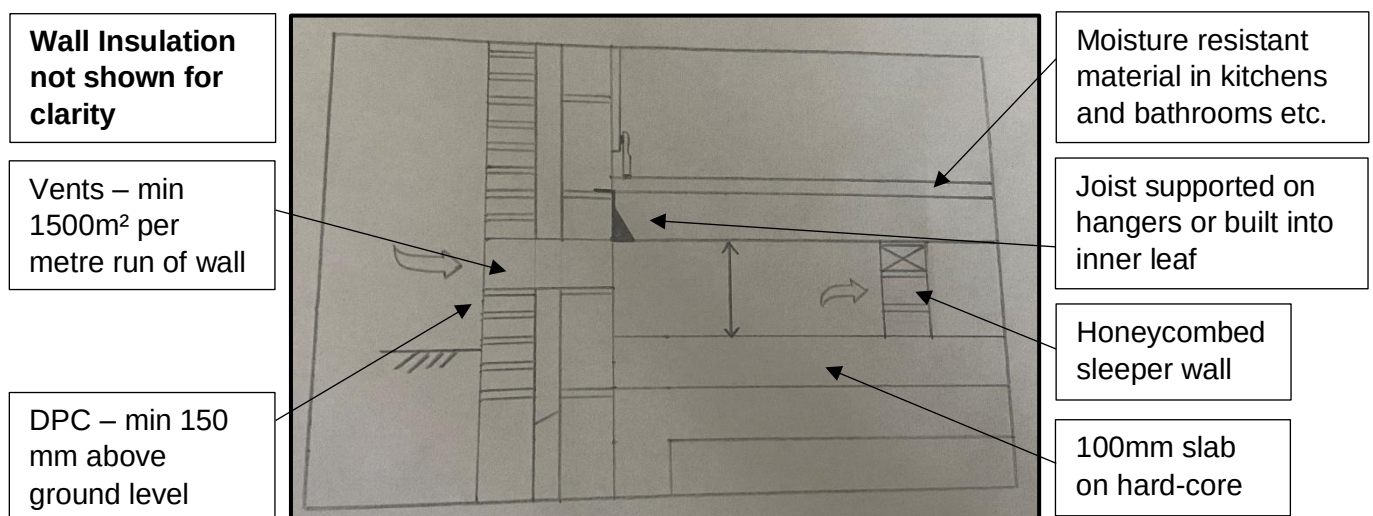
The Ground & First Floor : Construction, detailing and junctions with external walls

After careful consideration and a thorough analysis into available options, I have come to the conclusion that Timber will be used as the structural framework for the domestic property. Timber frames are known to be extremely resistant to breaking under tension (tensile strength) because of its ability to distribute the weight of a build evenly. Furthermore it is a very light weight material considering its tensile strength. As a final comment, prefabricated timber framing dramatically increases the speed of construction because of its ability to be accurately manufactured off-site for a variety of functions, thus making it very flexible as well in comparison to steel and concrete.



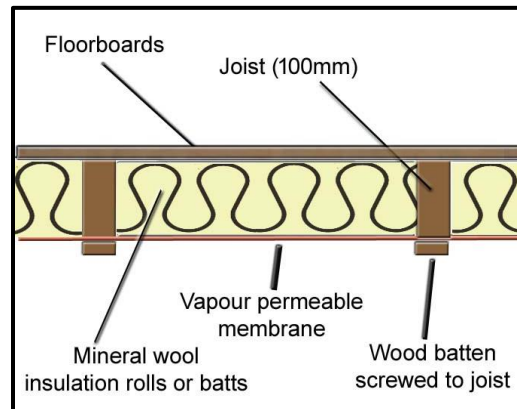
Moving onto discuss the ground floor of the property, it is stated within the specification that 'there is a suspended timber ground floor'. This is also commonly referred to as "floating timber floors" because of the use of the sleeper wall as support. This hollow floor will sit above the strip/slab foundations however will never touch it. This therefore means that there will be little preparation work required.

Figure 1.1 – Suspended Timber Floor



However, the hollow space between the floor joists (supported via the sleeper wall) and the foundation requires ventilation to reduce moisture and humidity – potentially leading to damage. This is identified in *Figure 1.1* above with the brick vent within the sleeper wall.

Figure 1.2 – Underfloor insulation



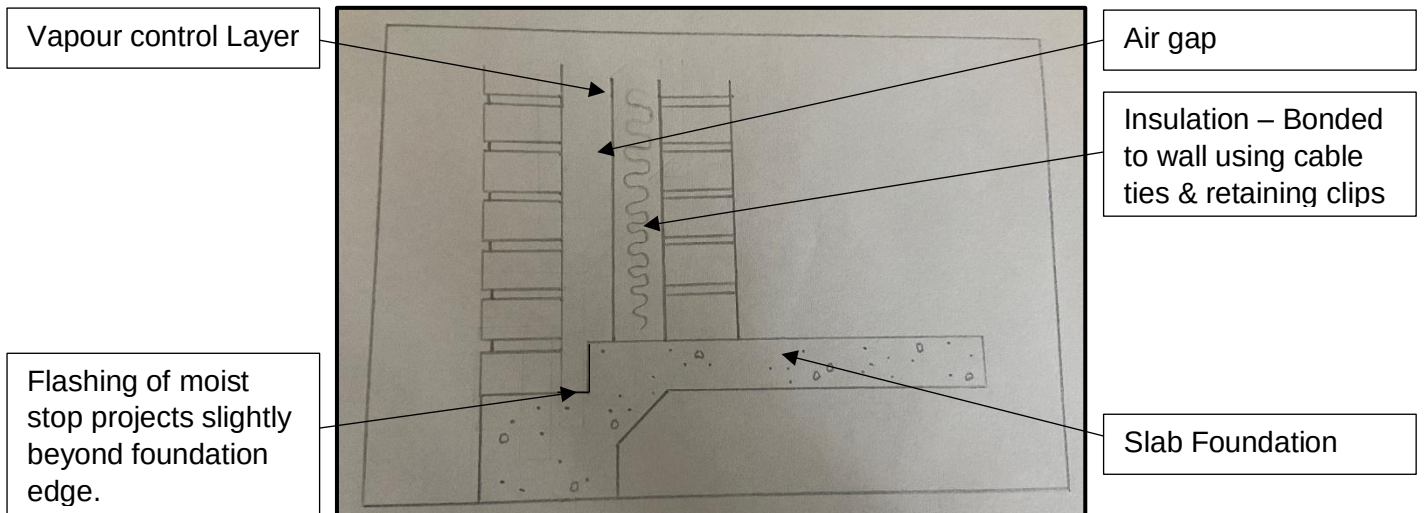
As for maintaining the heat and preventing heat loss through the floors. Insulation can be installed in a shelf-like fashion below the floor boards using the joists and battens. This combined with Vapour permeable membrane can also further prevent humidity getting through to the floors via below the property.

Keeping on the same topic of flooring, later on into the specification, it comments on the fitting of flooring, with it mentioning “Upper floors are to be traditional solid timber with tongue and groove softwood flooring”.



Tongue and groove flooring is considered an easy solution to installing wooden floors because of it's jigsaw-like joinery. The installation for this particular flooring is as easy as simply sliding the pieces together using the tongue and groove and later gluing or nailing the pieces together to increase strength/ durability.

To complete the ground floor and first floor construction detailing, I would like to illustrate the external walls to the domestic building. Again, referring to the specification the building: “The building is of standard cavity wall construction; block and block with partial fill cavity insulation and a smooth render externally. Plinths, soldier courses and all openings and porch pillars are to be natural sandstone”.



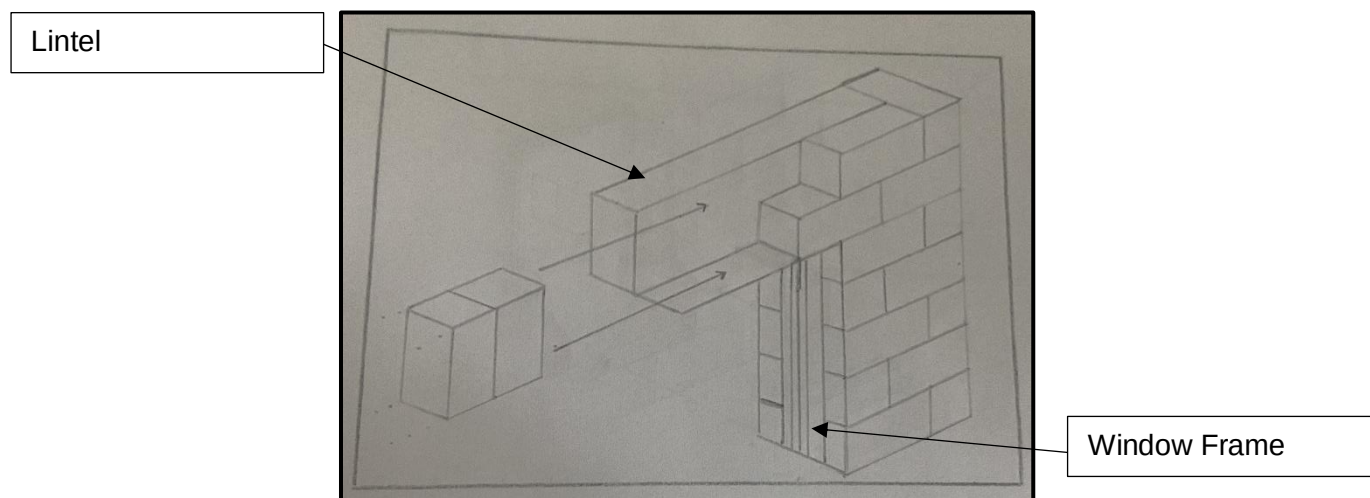
The use of two walls with a cavity between them creates a double skin. The purpose of a double skin is to gain additional weather protection, increase thermal insulation and noise attenuation. A Damp Proof Course (DPC) can be applied between layers of the blockwork to prevent groundwater from being absorbed by capillarity action in walls. To address the drainage problem of the cavity, I would like to suggest the installation of weep holes in place of the cement bond between bricks. This is very aesthetically pleasing due to its small size, however with adequate placement, can maintain the required drainage of the cavity if water (rainfall) manages to penetrate the external wall. The use of blockwork over brickwork will be far more cost effective due to the comparable size of the blocks to the bricks. In addition, said blockwork will not be visible on the end product because of the render coating applied externally.



Openings : Solutions for lintels, sills and jambs

When windows and doors are installed and constructed in houses, it removes a large portion of the brickwork that would otherwise be in their place. This ultimately decreases the tensile strength of the wall therefore making it more vulnerable to being damaged through bearing too much stress and weight. It is often apparent above windows, where cracks begin to form and damage is visible above windows where there is very little strength in the wall in comparison to the excessive weight bearing down on it because of gravity. Constructing a lintel is one such way around this, and provide further structure and support to the building. The main function of a lintel is to take loads coming from above and transfer its load to the side walls.

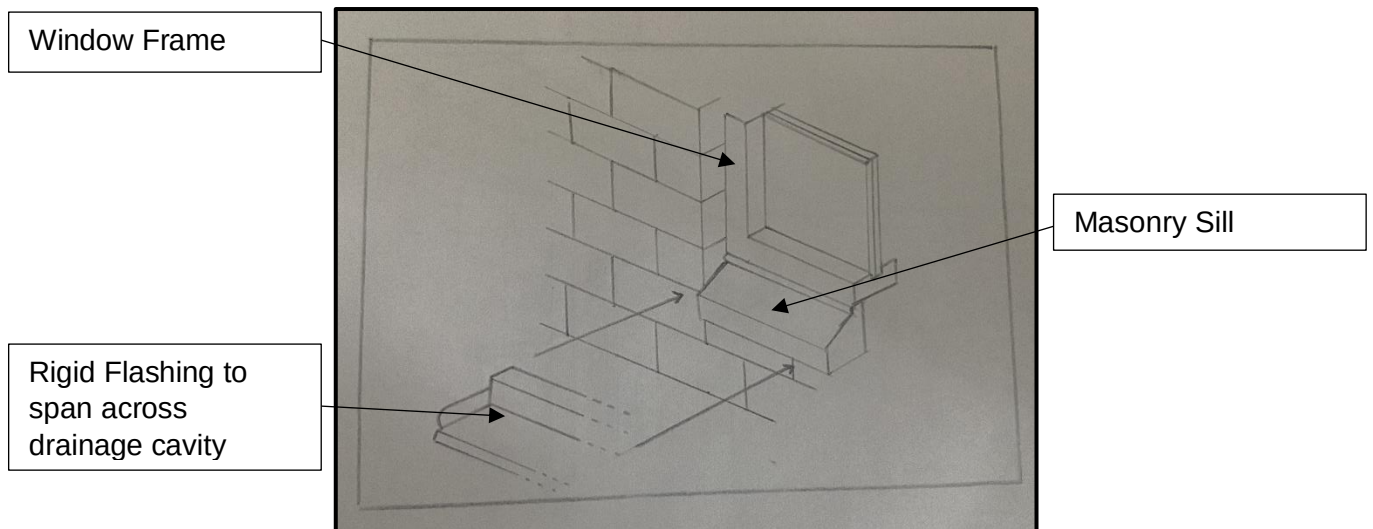
Figure 2.1 – Metal Lintel



As shown in the annotated drawing 'Figure 2.1' above, you can identify a metal support lintel being used to restore the strength above the window. This would be apparent above the external doors to the property as well. The use of metal elements for lintels, such as the one shown above means that it is a light weight solution compared to concrete, steel and timber lintels. In addition it is fast to install and a cheap solution in comparison to the other mentioned options. This can be further improved by being hidden behind brickwork as it has the ability to restore the strength for the above portion of the building whilst being able to hold bricks in place above. As per the initial drawings provided and my own illustration above, you can see that the bricks can be stacked vertically using this lintel. However metal lintels do unfortunately cause thermal bridging if incorrectly installed/insulated and can therefore be a key factor of heat loss.

The Building Regulations Approved Document Part M identifies the key specification that all lintels must meet and follow if required and installed. To summarise, lintels require a minimum end bearing of 150mm, bedded on mortar and levelled along its length and width. BS EN 1996-2:2006 states that masonry above the lintel must meet its listed requirements, ensuring the lintel is supporting an appropriate load. A damp proof course or cavity tray should be installed over all openings in external cavity walls.

Figure 2.2 – Sills



Eaves Detailing and Roof Covering – Indicating appropriate weathering, fixing and laps

After analysing the drawings provided in the specification, I identified that the initial design of the domestic building has closed eaves. An eave is the part of the roof that projects out horizontally beyond the side of the structure it covers. They are installed on building to fulfil three main purposes, firstly to prevent rain, snow, hail and other debris causing damage to the building facade, secondly it can provide shade to windows situated below, and finally it can help define the buildings architectural style.

Figure 3.1 – Closed Eave

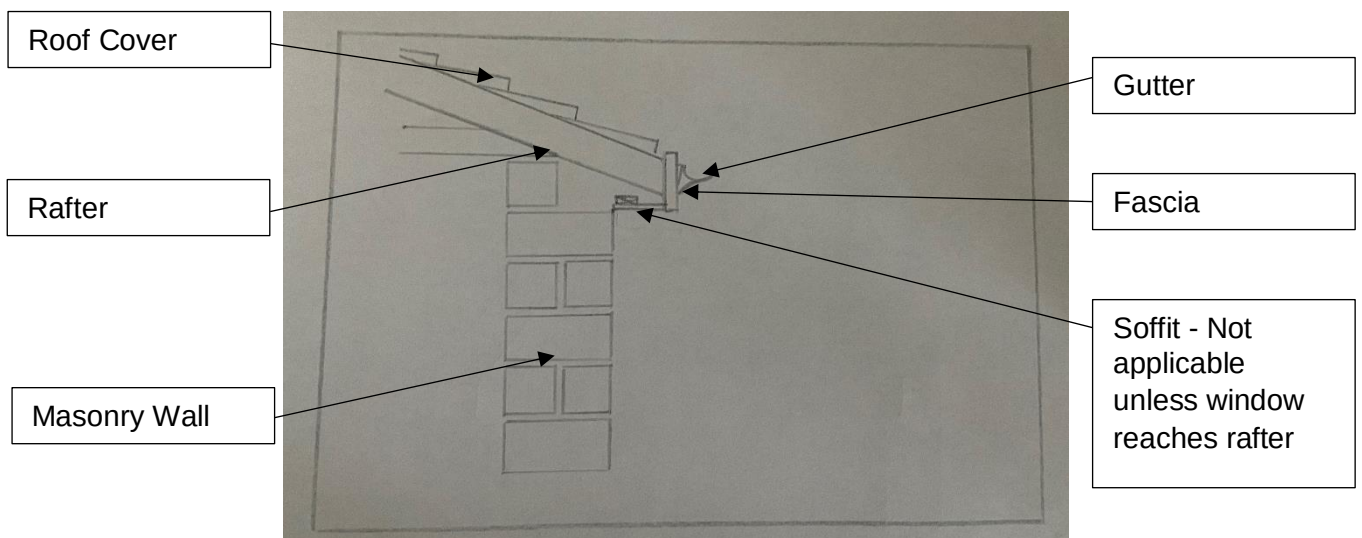
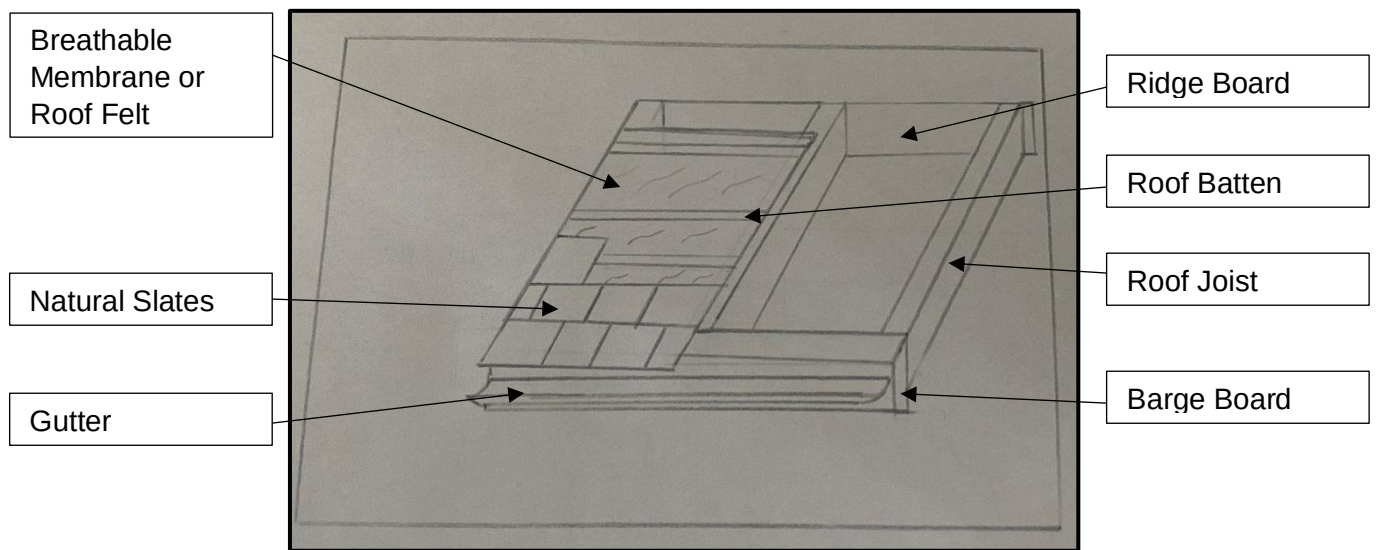


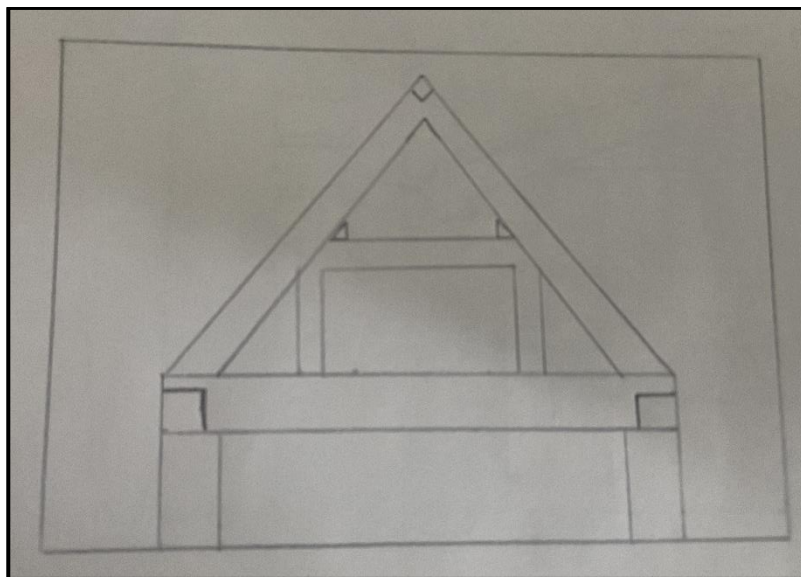
Figure 3.2 – Roof Cover



The Main Roof Structure : Construction, detailing and fixing

After careful consideration and thorough research, I came to the conclusion that the Queen Post Truss, shown in *Figure 4.1* would be the most viable option to meet its requirements and suit the specification. The reason behind me choosing this post over the variety of other choices is that within the specification it explains that the domestic dwelling will have “a loft room”. After further looking into the drawings and elevation provided with the spec I identified that the loft will require two rooms therefore requiring a large amount of head room and thus needing to be great in height. By analysing the variety of possible frames, I noticed that the queens post truss had provide space for a room in the middle, thus therefore meeting the specification.

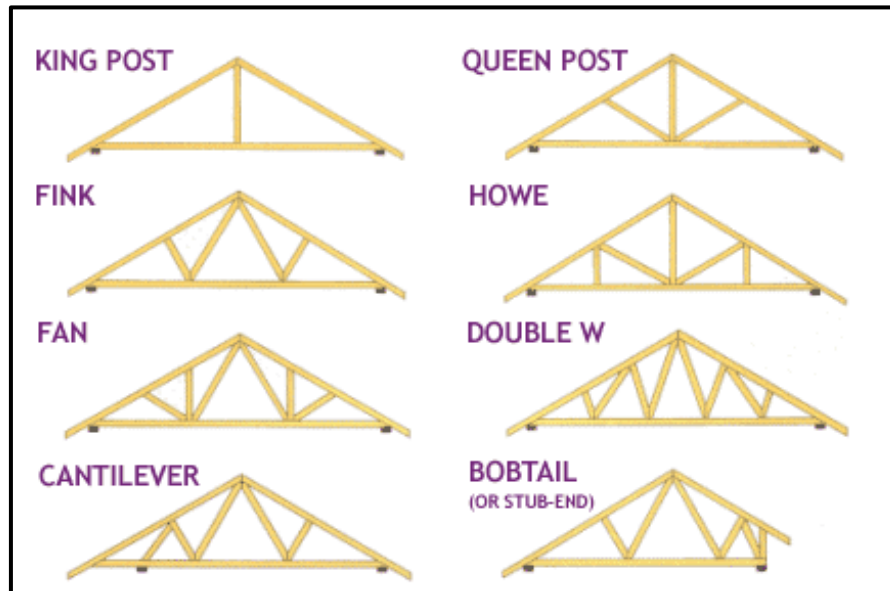
Figure 4.1 – Queen Post Truss



The purpose of a roofing frame is to carry the loads to the bottom of the building without causing significant damage to the structure. The trusses within the external roofing framework therefore helps transfer the loads across the entire roof, rather than it being

focused on the corners where the roof meets the eaves. It is apparent that within the designs provided, the loft also has three rooms, thus meaning there are two partition walls that can provide further support for the load to be transferred along and supported.

Figure 4.2 – Trusses



Shown in *Figure 4.2* are the other trusses that I assessed for their suitability for the domestic building.

Construction Detailing – Two Storey Detached Domestic Building

Construction Detailing :

- HM Government. (2013). *Building Regulations 2010*. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/429060/BR_PDF_AD_A_2013.pdf. Last accessed 9th Feb 2020.
- HM Government. (2016). *Building Regulations 2010*. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/540330/BR_PDF_AD_M1_2015_with_2016_amendments_V3.pdf. Last accessed 9th Feb 2020.