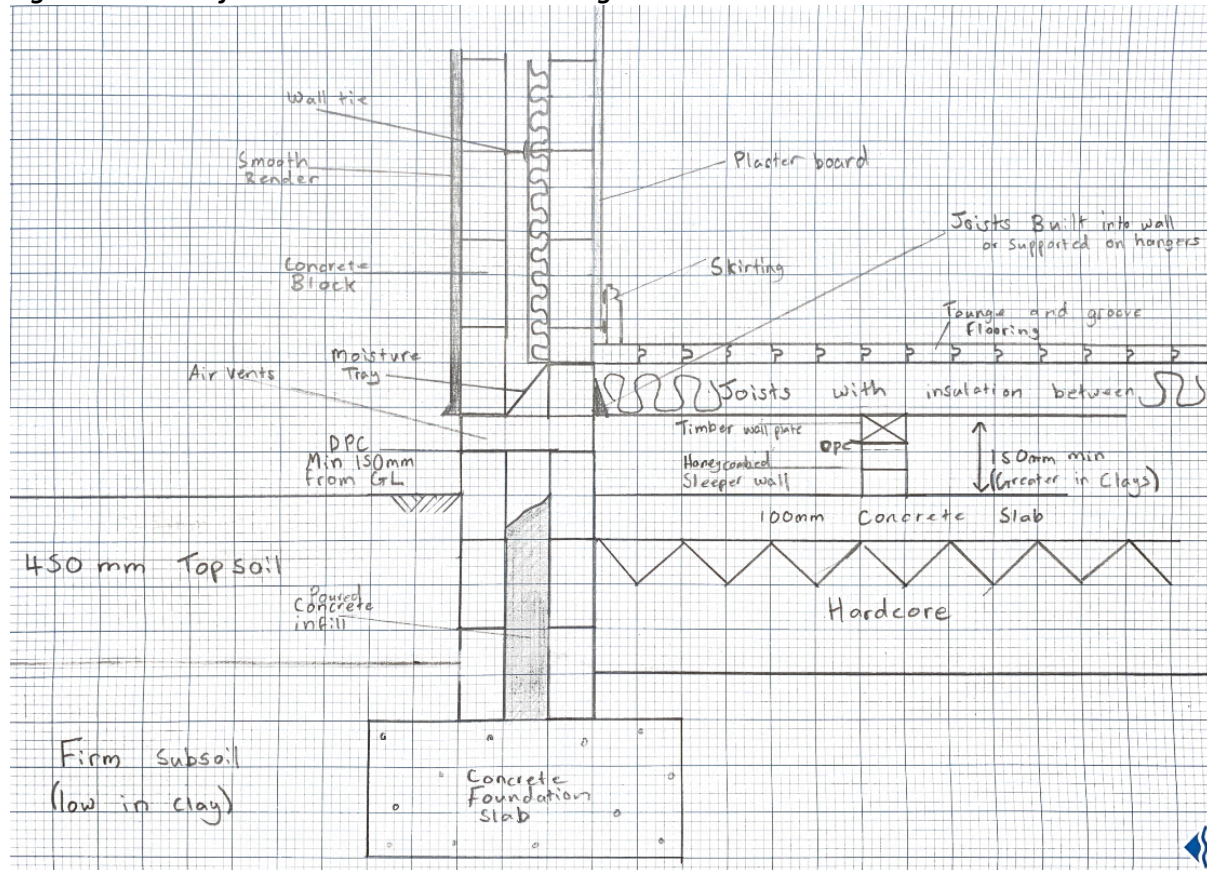


Construction Detailing

I will be displaying my knowledge of construction methods through sketches, and descriptions of the sketches. I hope to display my knowledge of the construction of foundations, cavity walls, upper floor structure, thermal insulation, damp proofing, ventilation and roofing in this assignment.

Figure 1- Ground floor and external wall detailing.

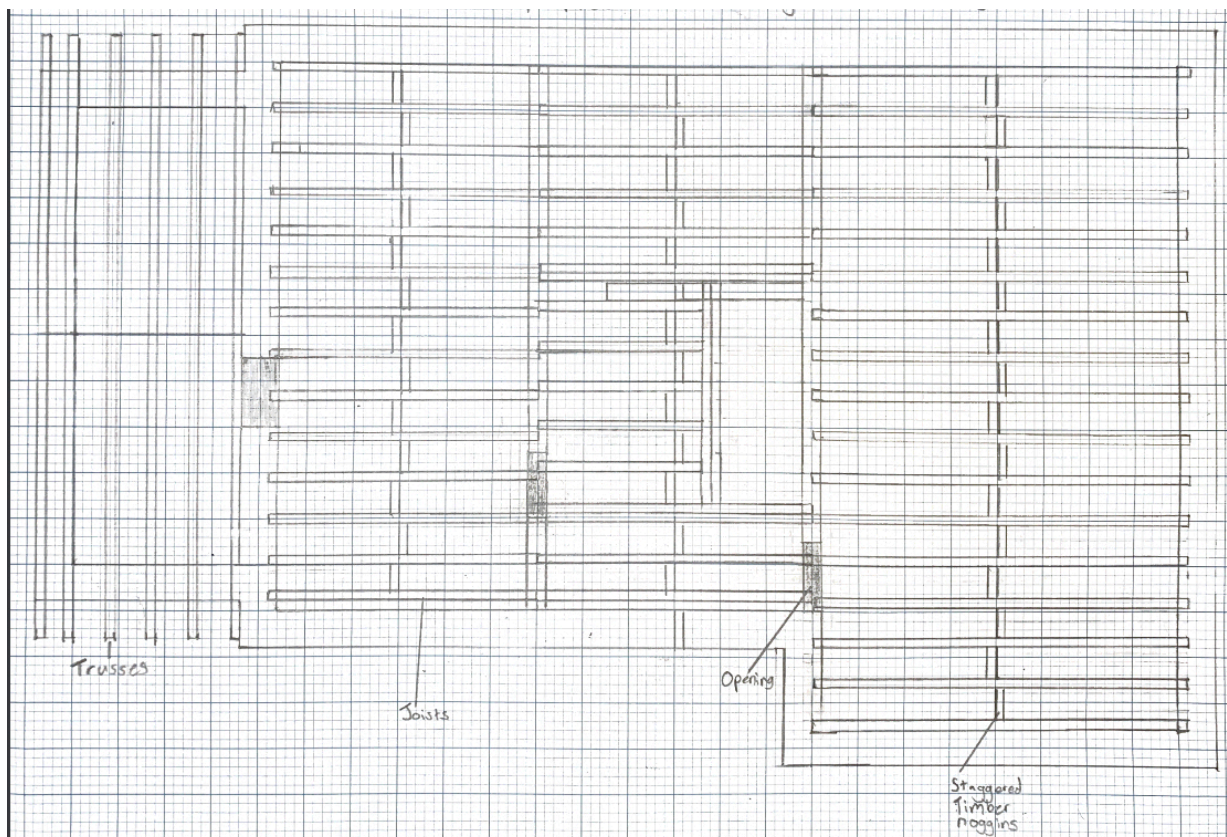


This sketch shows how the ground floor ties in with the inner leaf of the cavity wall as well as illustrating the insulation in the wall and how it is tied together with wall ties. At the bottom of the sketch we see the foundation structure. The foundation in this case would be a minimum of 1m depth and 600mm width. The foundation would be poured concrete with concrete blocks built on top of the concrete slab, and also concrete will be poured in between the two leaves or (Skins) of concrete blocks to add strength, if this is not done the layers of blocks will fail and collapse inwards due to the weight of the soil on the exterior. But also, the hardcore that will be on the inside of the wall will be vibrated to make it dense and ready for the concrete slab to be poured on top. If the cavity wall was hollow at this level the vibrations would easily force the wall to collapse inwards. Wall ties are crucial to a cavity wall as they stop the 2 skins of blocks from falling in separate ways from each other while also holding the Insulation board in place against the second skin of the wall using plastic disks.

At a minimum of 150m above ground level we have the layer of DPC (Damp Proof Course) that will stop rising damp from entering the building through the floor and up the wall. Above the DPC there will be a vent which allows a circulation of air to enter between the floating timber floor and the concrete floor beneath. This allows fresh air to enter the air under the floating floor that could lead to damp and affect the timber. As well as a vent there will be a series of sleeper walls beneath the timber floor that will have honeycomb shaped holes in the bricks that allows air to move through the sleeper walls and create better air circulation.

On the inner leaf of the cavity wall there is insulation board that helps improve the thermal insulation of the building yet also provide some moisture resistance as the board has foil on each side that stops airborne damp/moisture to reach the inner leaf. As moisture will be collected on the exterior face of the insulation board, it will fall downwards and will need an exit point. Therefore, a moisture tray will be at the bottom of the wall, just above the vents which will lead out through the exterior of the cavity wall, this is crucial as it stops the moisture from entering the building and causing damage to the structure. Between the insulation board and the external leaf of the wall is a hollow gap that prevents thermal bridging by leaving a space of air before the insulation, which reduces the thermal conduction that travels through the first leaf. On the outer leaf of the wall there will be smooth render and at the bottom of the render there will be a plastic bead which slopes outwards to direct any rain or moisture away from the vent and the wall beneath.

Figure2: Joist layout for first floor



This sketch shows how the joists will be layed out for the first floor. I have opted for premade steel webbed joists as they are a mixture of steel and timber that provide brilliant strength as well as easily lifted into position as they are lightweight. This will improve the quality of the job as well as the efficiency. Off site production also saves time as the work does not affect other workers on site by taking valuable working space or even storage space as they can be delivered on the day of works and finished on the same day. Between each joist at the ends 9 on top of the wall there will be blocks therefore, DPC will need to be wrapped around the ends so that the mortar mixture does not rot the timber over time. The load bearing wall will have timber noggins between the joists as there will not be a block wall built above it. Timber noggins will also be placed in the middle of every joist to provide strength and stability to the structure. The stair opening will have doubled joists to provide strength as It would be a weak point in the structure that may fail over time. To provide a strong and stable flooring for the first and second floor, there will be particle board flooring. This will add the strength to hold any weight imposed upon it as well as giving a solid floor to build the partitions on top of. The boards will give moisture resistance between floors.

Figure 3: Door openings with concrete lintel

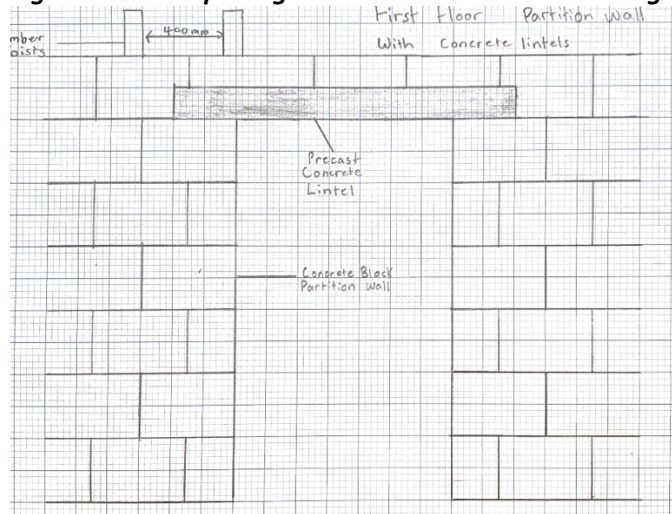
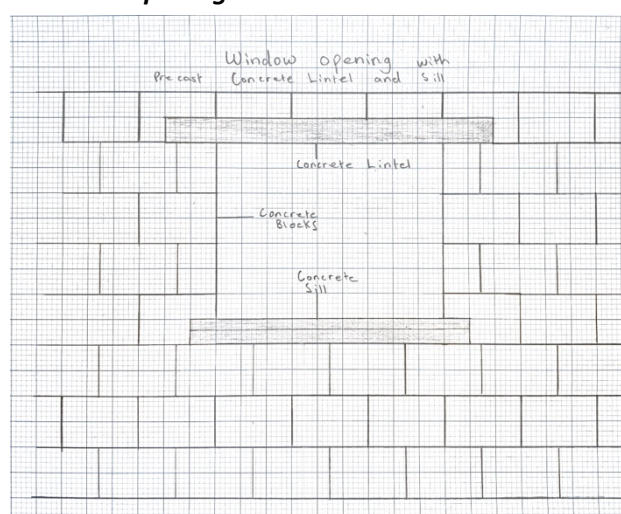
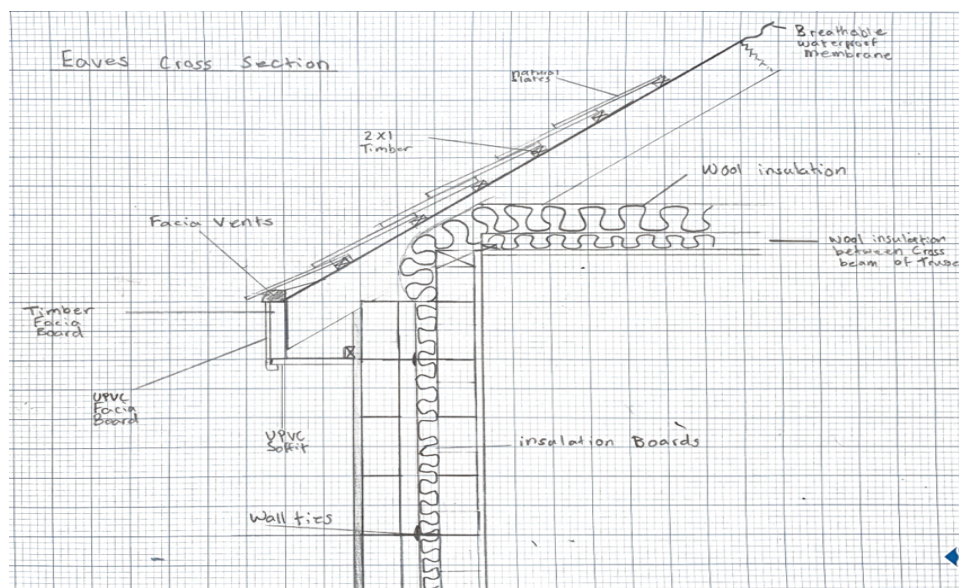


Figure 4: window opening with concrete sill and lintel



I have chosen precast concrete lintels as the best option for openings as it is easily fixed into a block wall as it is laid the same as a block would be laid and provides amazing strength compared to any timber lintel. It is also completely fire resistant and corrosion resistant. The cost of concrete lintels makes it a more of an attractive option compared to steel or timber as well. The concrete lintel is also a better insulator as it provides better insulation than steel. The concrete sills are also a better option to the alternatives as it has the same properties as a concrete lintel and are made off site ready for delivery when needed. They are widely used and sold. They also provide a nice finish to paint over.

Figure 5: Eaves Detailing/cross section.

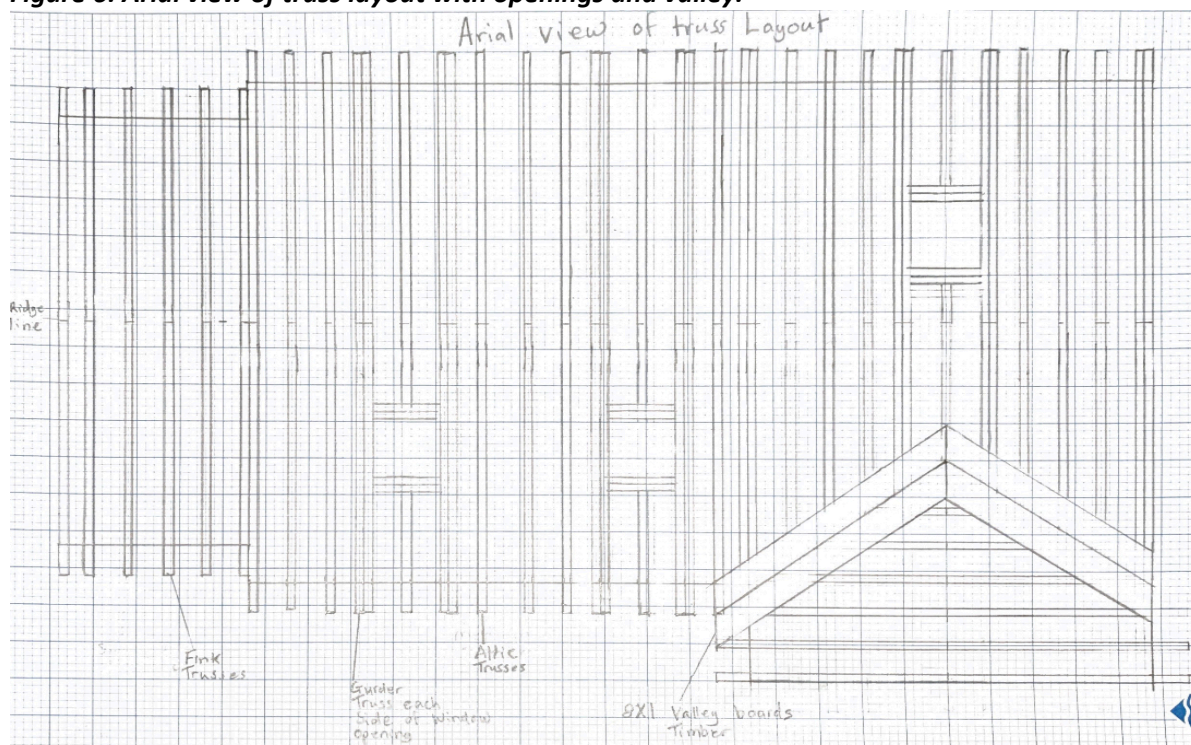


The roof covering will be a natural slate finish with breathable felt and 2x1 to fix the slates onto. The felt will be a massive part of the waterproofing as it is the last defence against water coming through the roof. The felt goes over the rafters first working from the bottom of the roof to the top, while adding the 2x1 timber as well. But its important to ensure that the felt overlaps each other at a minimum of 150mm. the felt is stapled on while the 2x1 is nailed to the rafters through the felt. The slates can then be fixed to the 2x1 timbers with copper nails to ensure that water does not rust and damage the nails in the future. It is also important for each row of slates to overlap each other at a minimum of 100mm over the nails. Every row of slates should be staggered by half the width of the slates. At the bottom of the slates between the fascia and the first row there

are over fascia vents. These vents help allow ventilation between the felt and the insulation fitted between the rafters above the vents there should be a layer of DPC spanning from the first 2x1 timber over the vent, this prevents rainwater and moisture from pooling at the bottom of the roof under the slates. There will be a timber fascia board fitted at the bottom ends of the rafters. This will allow the UPVC fascia boards to be fixed to the sides, which will curl around the bottom over the soffit board leaving a watertight covering. The soffit will be fixed to the bottom of the fascia and to a 2x1 timber that will be fixed to the block wall, this 2x1 will be fixed in level with the bottom of the fascia board.

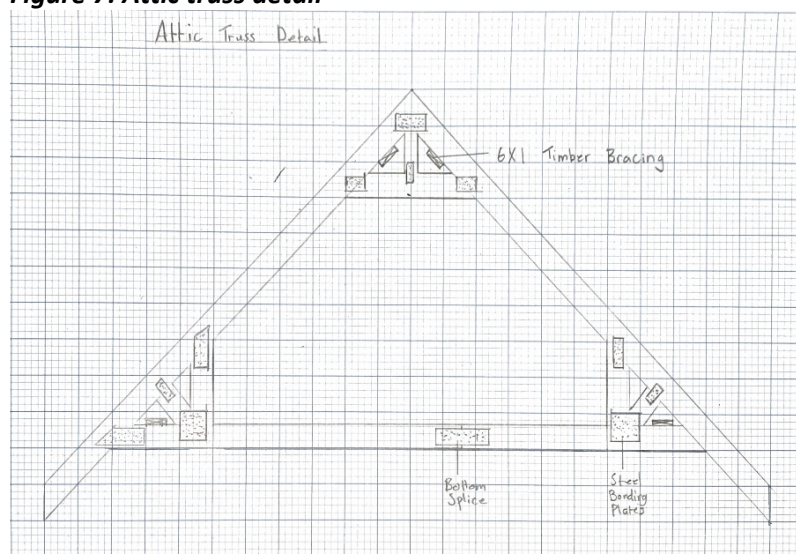
Between the horizontal timbers of the trusses a 150mm thick wool insulation will be fitted to maintain the heat between the different floors, the same insulation will be used between the ground floor and the first. This insulation will follow the roof around to stop cold spots in the corner of the rooms as shown in the sketch.

Figure 6: Arial view of truss layout with openings and valley.



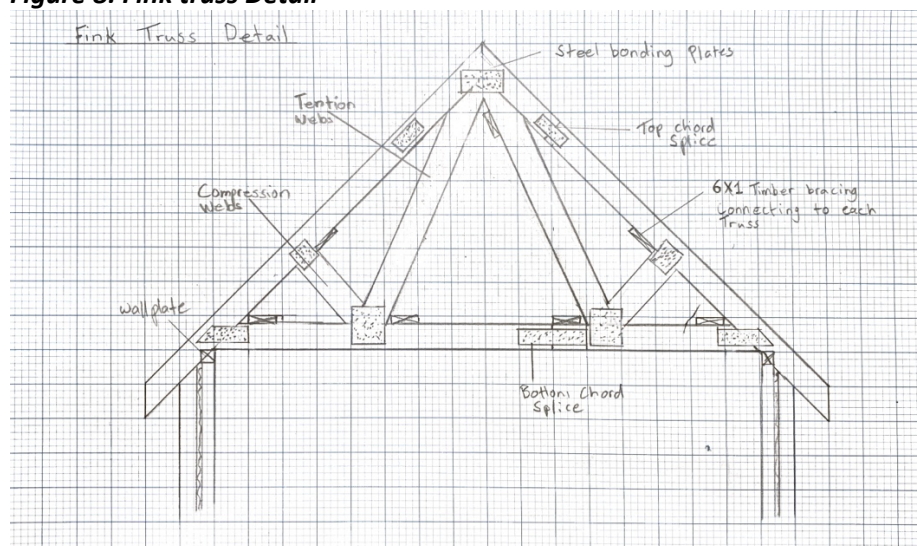
The trusses will be layed out at a minimum of 400mm spacing between them. A crane will lift them into position while workers will fix the trusses at the wall-plate with screws. To hold the top of the trusses in place a temporary timber can be used to hold the trusses in the correct position. The trusses will be held in the correct position by a series of 6x1 timber spanning across the whole course of the trusses (as shown in figure 7). The trusses that will have an opening in between them will be a girder truss, meaning two will be fixed together to create a stronger more reliable truss to take the weight of the window. Where the valley will be, there will be a purlin which is a large timber spanning from the bottom of the valley to join with the apex of the valley. Each truss will be connecting into the side of this purlin for strength. After this is completed on both sides of the valley there will be 2 boards usually 9x1 timber spanning over the top of the trusses in line with the valley, the purpose of this is to hold the 18" wide, code 6 thickness lead that will cover the valley boards and direct the rainfall into the guttering at the bottom of the valley. The breathable felt will follow under the lead and over the valley boards. The slate will then overlap the lead leaving the lead to be on show in the middle of the valley about 150mm. At the very ridge of the roof there will be ridge tiles that are fixed to the roof and will prevent water and moisture from going under the slates and potentially into the building.

Figure 7: Attic truss detail



The attic truss will be used where there will be loft space as it provides space in the middle of the truss for a loft space. The attic truss is held together by steel bonding plates that span over the joints of the wood. It fixes to the wood using multiple spikes that span across the whole plate. These plates are on both sides of the truss. As previously described after (figure 6), there is a 6x1 length of timber that spans through every truss and is nailed onto every truss to keep the trusses correctly spaced and in line with each other. Between each truss flush with the inside of the rafter, there will be 100mm insulation board, this will help insulate the loft from the cold roof. A thinner 50mm insulation board will line the whole loft as extra insulation and the joints between each board will be taped with a foil tape to ensure maximum thermal efficiency. This will be covered with plasterboard, then skimmed and painted.

Figure 8: Fink truss Detail



This Truss is Called a fink or 'W' truss. This type of truss will be used over the utility and bathroom as there is no need for loft space. The shape is formed to prevent collapse inwards and downwards. This will not require insulation boards but will require 2 layers of insulation wool in-between the horizontal timber of the trusses and over the top of the timber in the opposite direction to increase thermal efficiency of the building. The same fixing will be used for this truss, screws at the bottom into the wall plate and 6x1 timber spanning the length of the trusses from the block wall to the pine end. These trusses will be felted and slated exactly the same as well. The 6x1 on the vertical timber will make a continuous v shape to stop the roof from tilting to one side.

Student number:1911552

Module code: ACBA4001