

BACHELORS DEGREE ASSIGNMENT SPECIFICATION

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Programme:	Built Environment Programmes – Level 4.BSc (Hons) Project and Construction Management;BSc (Hons) Quantity Surveying; BSc (Hons) Building Surveying; BSc (Hons) Architectural Technology. HNC and HND pathways.		
Module:	Fundamentals in Construction Technology	Module Level (4, 5, 6):	4
Module code:	ACBA4001	Contribution to Overall Module Assessment (%):	50%
Lecturer:	Tom Duxbury	Internal Verifier:	Trevor Francis
Assignment Title:	Domestic New-build	Assignment No (x of x):	2 of 2
Hand Out Date:	Week Commencing 12/02/19	Submission deadline:	30/04/19

Referencing:	In the main body of your submission you must give credit to authors on whose research your work is based. Append to your submission a reference list that indicates the books, articles, etc. that you have read or quoted in order to complete this assignment (e.g. for books: surname of author and initials, year of publication, <u>title of book</u> , edition, publisher: place of publication).		
Disclosure:	I declare that this assignment is all my own work and that I have acknowledged all materials used from the published or unpublished works of other people. All references have been duly cited.		
Student's Signature:	<i>Assignments will not be accepted without a signature here</i> <i>Alison Durie</i>	Date:	29/04/19
Turnitin: Lecturer tottick to indicate if an electronic version of the assignment must be submitted to Turnitin. Note: the Turnitin version is the primary submission and acts as a receipt for the student. Both electronic and paper versions MUST be submitted by the same deadline. No marks will be released until both submissions are received. Late submission of either the electronic or paper version will result in a late penalty mark. Penalties for late submission: Up to one week late, maximum mark of 40%. Over one week late, Refer. Only Year Tutors and the Programme Director may grant an extension.			YES NO

Learning Outcomes tested (from module syllabus)	Assessment Criteria. To achieve each outcome a student must demonstrate the ability to:
1, Identify the different types of substructure available for a low-rise building and techniques used in their production. 2, Define and produce annotated sketches that illustrate a broad range of common constructional forms,	Differentiate and select suitable building methods for these built forms and produce neat sketches that illustrate appropriate performance criteria. Produce evidential understanding of moisture management in modern standard construction and

demonstrating understanding of their potential defect and repair needs
3, Identify the function and performance criteria that need to be addressed in buildings, their elements, components and materials.

demonstrate an understanding of the defects that can occur.

- Please submit the assignment parts in a suitable report folder– not in poly-pockets.
- This form (ALL PAGES) MUST be at the front of the paper submission. Assignments will not be accepted without this form as it is a requirement that you sign the disclosure regarding referencing convention.
- DO NOT put this form into Turnitin or it will match many similarities with other students' submissions.



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Submission 30 April 2019

Module code ACBA 4001
Construction Tech 2

New Domestic Build

HND Building Surveying

Thomas Duxbury

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Fundamentals in Construction Technology – Domestic New-Build

Foundation for Domestic New Build

The site is a green-field so has undisturbed ground. Subsoil is known to be firm with a low clay content therefore, once the top soil has been removed to a depth of at least 450mm, a strip foundation could be used for this build as it evenly distributes the load throughout the building. Foundation depth would be in accordance with building regulations of at least 750mm to the underside of foundation to a maximum of 900mm. (section e part A Building Regulations, pg 44)

The construction is considered light-weight. If the minimum standards are achieved in terms of building regulations, a strip foundation with block and block cavity walls would be sufficient. A medium density concrete (MDC) block for the outer leaf and thermal block for internal leaf can be used.

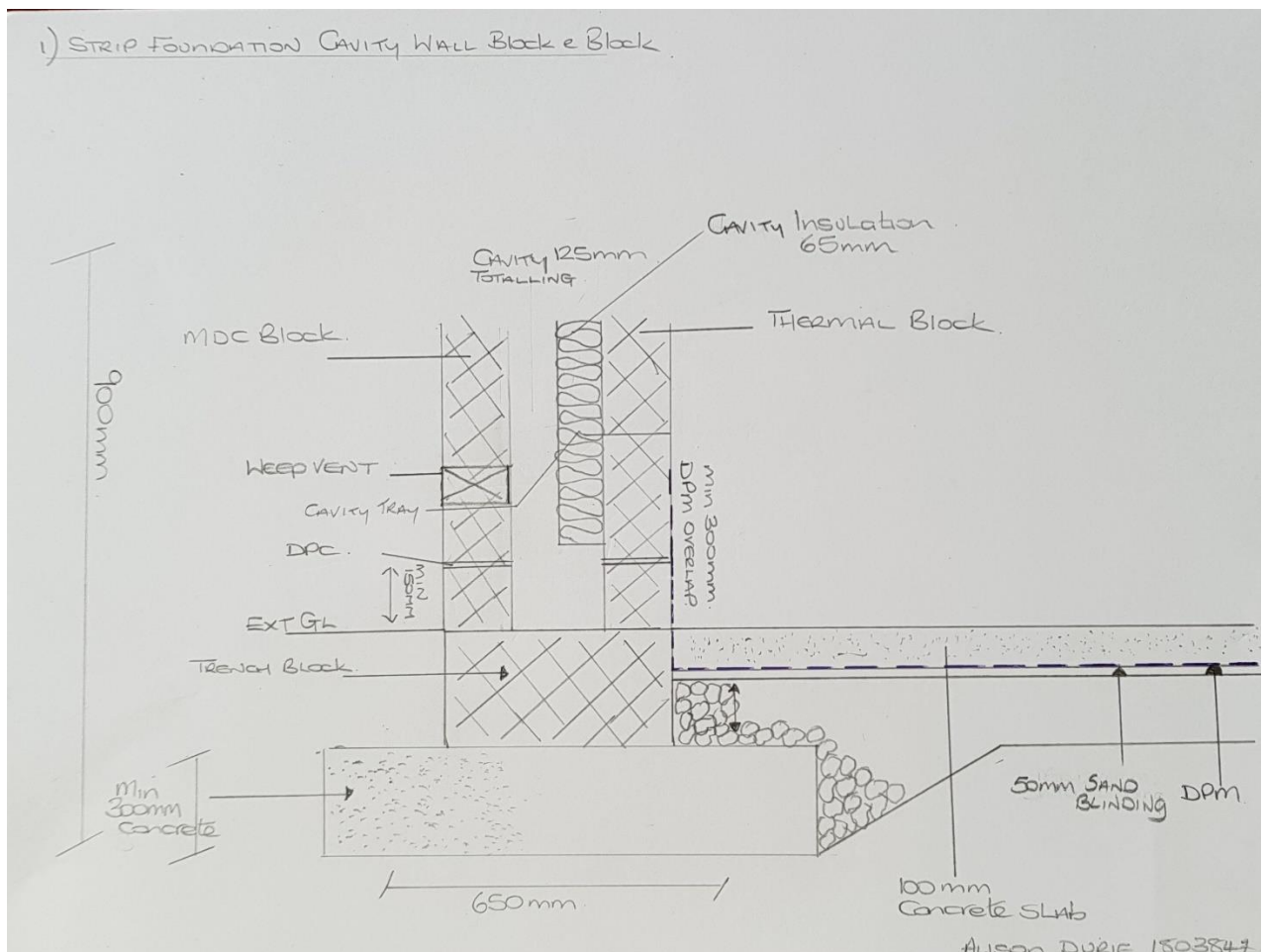
The thickness of a strip foundation would normally be between 150mm and 500mm. 300mm thickness is used in most small domestic works. However, in this case the strip foundations would be 650mm wide to allow for 150mm scarcement either side of the cavity wall construction to reduce the risk of movement. Building regulations outline a range of plain concrete foundation sizes based on the bearing load, with the range from 20-70 Kn/lm the width of foundation would range from 250-850mm. (Building regulations part A, section E, pg 44)

Strip foundation: Poured concrete will be 300mm in depth with an additional trench block, for example Airtec 10 8.7 N/mm² blocks can be used as a 10.4 N/mm² block in structural design has a Category I manufacturing status. (BS 5628 Code of Practice for Use of Masonry, Part A building Regulations, 2010) in accordance with BS 5628 - Part 3 providing the base for the external walls. Compacted hardcore will be used as infill. A layer of sand blinding will be applied to a minimum depth of 50mm before the DPM is applied, with a 300mm overlap at internal face of the internal leaf. The DPM (Damp proof membrane) will meet the DPC (Damp proof course) which continues through the blockwork to prevent any ground water entering the super-structure. Above the DPM

will be a concrete slab with an air gap of at least 150mm to the underside of the timber joists.

The ground floor is of suspended timber construction. Rigid insulation is installed between joists. Kingspan Thermafloor, 170mm, to achieve the u-value 0.13 required by part L of the building regulations for new builds. (building regulations Wales 2010, Part L)

1) Strip foundation, cavity wall block & block (annotation)



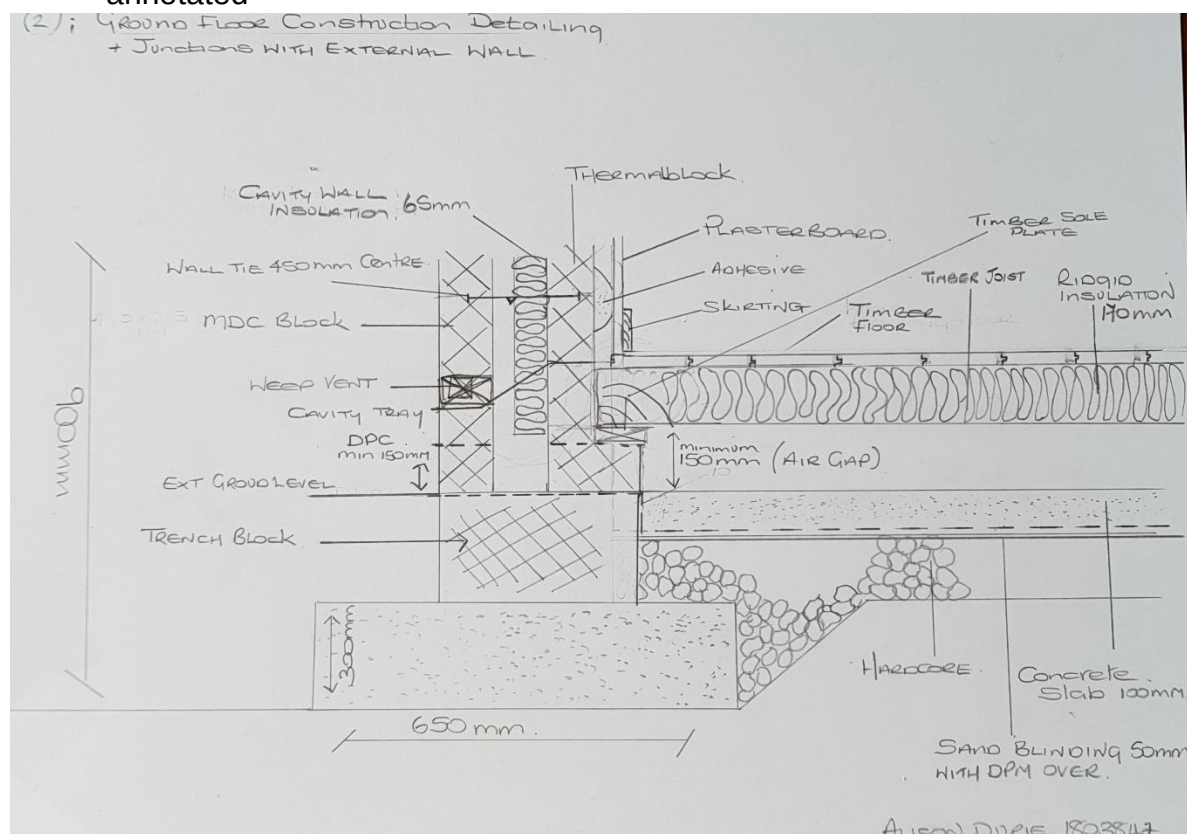
Appendix 1 (original provided in hard copy submission Alison Durie)

Ground floor construction, detailing and junctions with external walls

For buildings between 3.5 - 9m high the minimum standards for external walls, following guidance from Building Regulations Wales 2010, would be a minimum of 190mm to full height. Each brick or block leaf would be no less than 90mm thick with a cavity at least 50mm. Wall ties should be fixed horizontally at 900mm centres and 450mm vertical centres averaging 2.5m^2 . Wall ties should be no less than 225mm from a vertical edge, openings, movement joints and roof verges. At these points they should be centred every 300mm. Wall ties should comply with BS 1243 250mm with a vertical twist. (section 2c part A, pg 29 building regulations, 2010)

Blockwork should comply with Building Regulations part A England and Wales, 2010 for domestic new-build of 2-storey construction as well as BS 5628 (codes of practice use of masonry) and BS 8103 (structural design of low-rise buildings). A block size of 440x225x100 in accordance with BS EN 771-3&4 provides a compressive strength of 2.9n/mm^2 (Thomas Armstrong Ltd)

2) Ground floor construction detailing & junctions with external wall sketch annotated



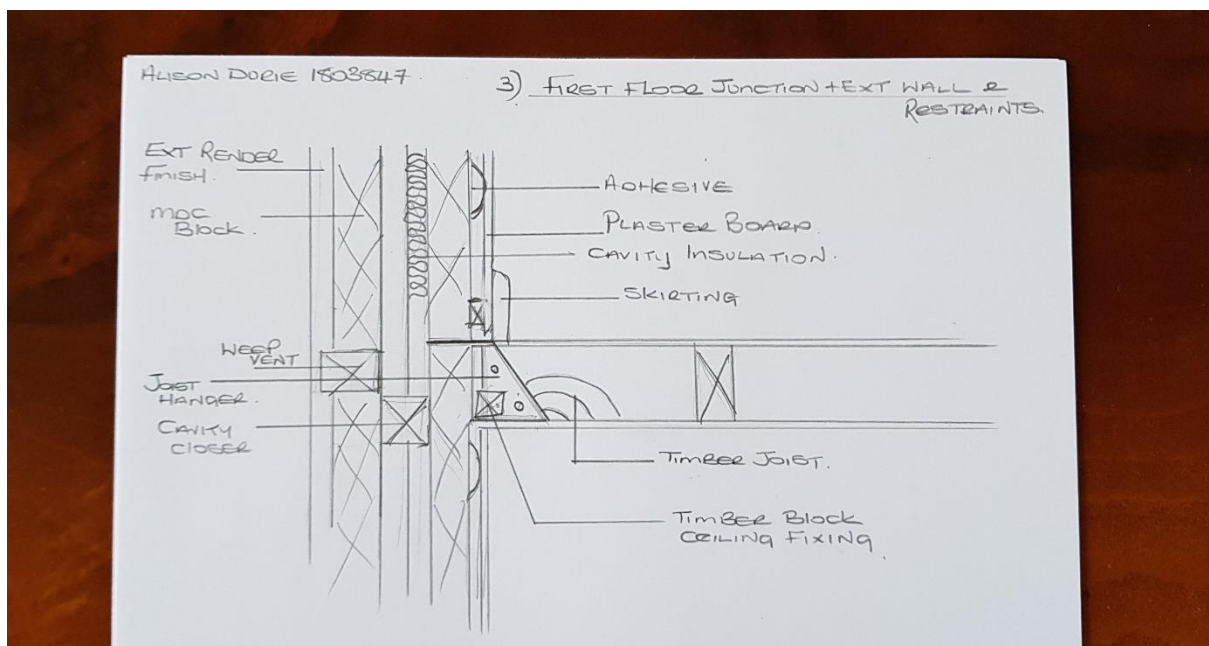
Appendix 2 (original provided in hard copy submission Alison Durie)

First floor: construction, detailing & junctions with external walls and restraints

First floor is of suspended timber with tongue and groove softwood flooring. Joists installed comply with BS 8103-3:2009 and building regulations (part A). Joists are installed at 600mm centres and, with maximum clear span not exceeding 4.02m, could use C16 grade timber 220mm x 47mm, with an imposed load not exceeding 1.5kN/m² (easi-timber.co.uk). Trada (UK manufacturer & supplier) also suggest 220mm x 38mm C24 timber could be used, which is a higher specification and heavier strength class. It would be down to cost as to which timber was purchased as both comply are suitable.

Joist fixings would be via a standard masonry fixed joist hanger of galvanised steel, attached between the blockwork for example; Simpson Strong-Tie Masonry Supported Joist Hanger 225 mm providing up to 10Kn safe working load. (Travis Perkins.co.uk)

- 3) First floor: construction, detailing & junctions with external walls & restraints - annotated

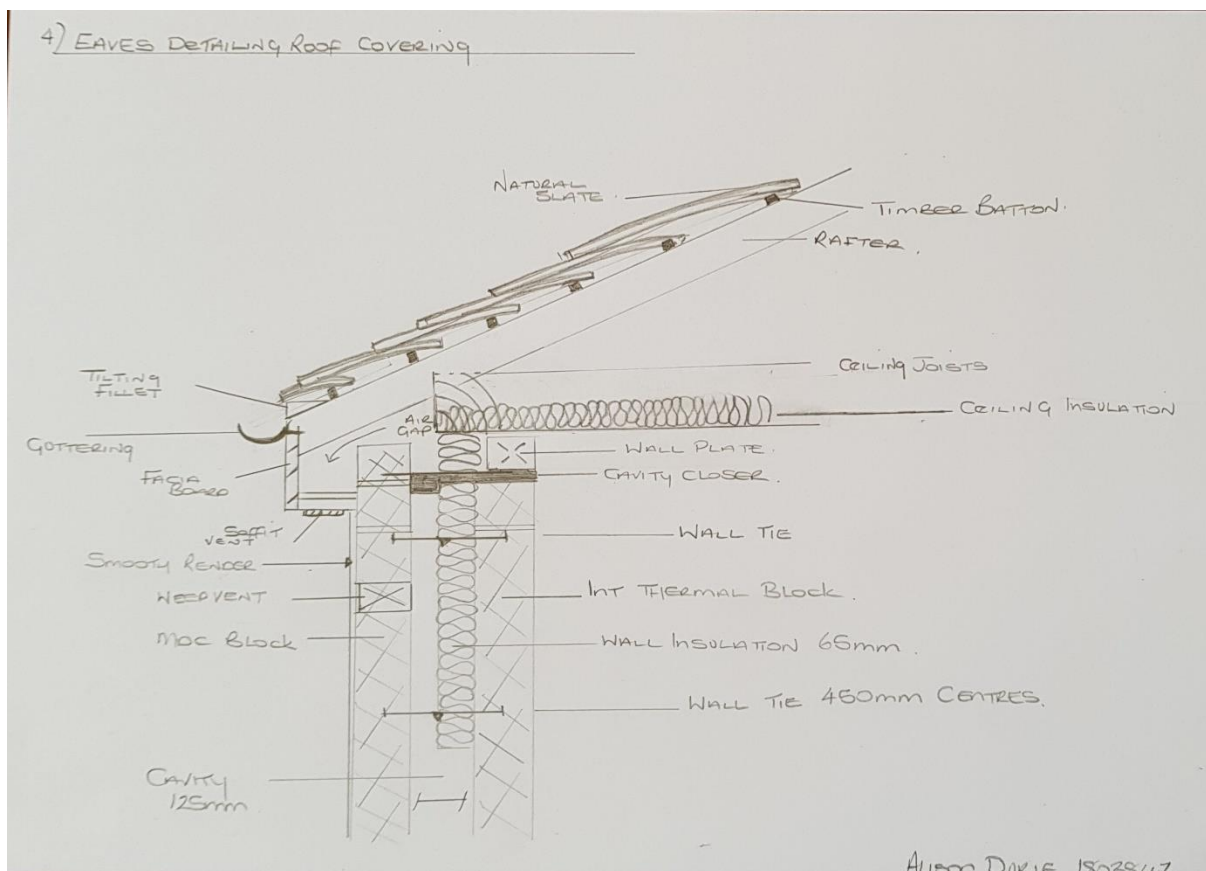


Appendix 3 (original provided in hard copy submission Alison Durie)

Eaves detailing and roof covering, appropriate weathering, fixings and laps

The roof structure for this new build is engineered trust rafters which will be compliant with building regulations. Rafters will be delivered to site fully constructed with the necessary nail plates already in situ. Natural slate is forming the weathering and will be fixed via timber batons using galvanised steel slate nails. A small timber tilting fillet fitted at the eaves will raise the bottom courses slightly to ensure rain water is projected away from the building into the guttering. Facia board and soffit with eaves ventilation are installed to allow maximum air flow to the structural roof timbers. Ceiling insulation of 125mm thk Kingspan Kooltherm can be used to comply with new-build regulations achieving a U-value of 0.13 (Kingspan, 2019). A cavity closer has been installed at the wall plate at the eaves.

4) Eaves detailing roof covering sketch annotated



Appendix 4 (original provided in hard copy submission Alison Durie)

Main roof structure, construction detailing and fixings

In accordance with building regulations England and Wales 2010, minimum standards are required:

The building fabric should provide a weather-tight envelope to minimise or prevent the ingress of moisture from external sources, BS 5534 deals with a number of factors associated with pitched roofs. This standard has been updated in recent years due to the worsening weather patterns experienced within the UK. ([Ashbrook roofing.co.uk](http://Ashbrook.roofing.co.uk)). The recent amendment to BS 5534, along with the introduction of BS 8612, has sought to improve the product quality and standard of installation of dry-fix roofing systems. Some of the significant changes involve roof membrane/underlay, which must now meet BS 5534 and take cognisance of geographical locations and wind speeds. (Marley.co.uk). Underlay at the ridge of a slate roof should have an overlap of a minimum of 150mm. ([Welsh Slate.com](http://Welsh.Slate.com))

For fixing a natural slate roof, timber battens should be in accordance with BS 5534 part 1 1997, factory graded 50mm wide and 25mm thick and be supported at each end, at a maximum of 600mm centres and BS 1202:2004 shows the Specification of nails to be used with slate roofing.

BS EN12326 ensures that all slates sold in the UK are tested to the same way using the same method, irrespective of their origin. All slates tested in this way will carry the CE mark, any slates without this mark are not compliant with current British Standards.

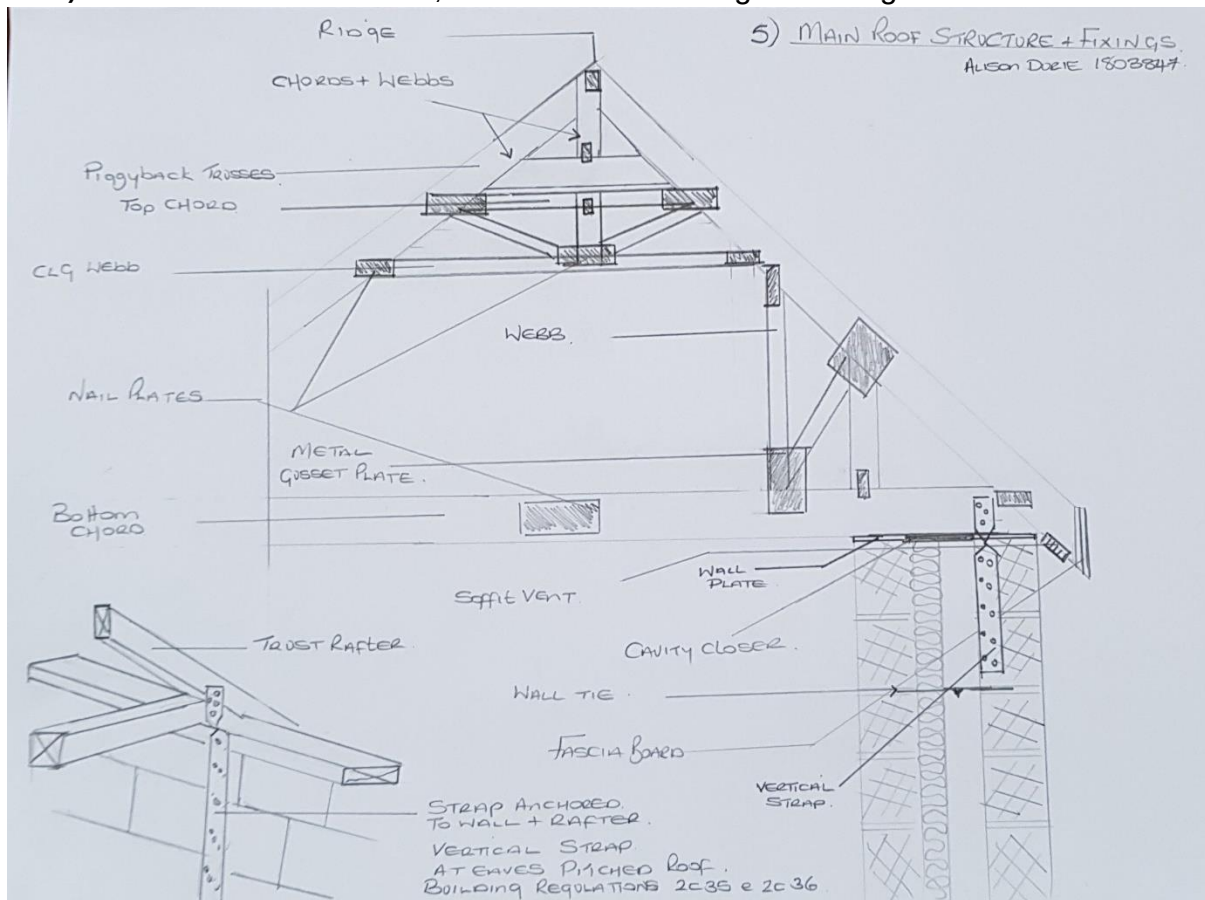
To comply with BS 5250 1989 (1995) Code of practice for condensation in buildings, ventilation equivalent to 10mm continuous strip vent must be provided at the eaves on both sides of the roof if described as a 'cold roof' Additional ventilation will be required at the ridge equivalent to a 5mm continuous vent as the pitch is set at 40° and the insulation has been installed at ceiling level. ([SSQ natural roofing design slate and fixing guide](#))

Tension straps should comply with BS EN 845-1 and, for corrosion purposes, material should be of galvanised steel and comply with 14, 16.1 or 16.2, with a tensile strength of not less than 8Kn. Vertical strapping should be at least 1m in length at eaves level and at intervals not exceeding 2m. If joists are no more than 1.2m apart, tension straps

should have a bearing on wall plates at least 75mm, or alternatively on a supported wall 90mm (Building Regulations, Pg 32 part A Sc35)

Lateral restraints at roof level walls should be tied horizontally at no more than 2m centres at eaves level, base of gable and along roof slopes. Straps should be fixed in accordance with 2c35 & 2c36 of the building regulations 2010. (Building Regulations, Pg 32 part A)

5) The main roof structure, construction detailing and fixings



Appendix 5 (original provided in hard copy submission Alison Durie)

Advantages and Disadvantages of Existing and Alternative Roof

Existing Roof: Advantages

The main advantages of the existing roof is the speed at which the trust rafters can be fitted as they come to site already constructed. This saves labour time on site as well as minimising cost as the trussed rafters are designed and specified based on the choice of roof materials to be used, load capacity and height of building. As the trussed rafters are made off site, they are quality controlled before leaving the manufacturer.

Existing Roof: Disadvantages

Any changes to the existing attic space would be costly. For example, if a change was required from storage to additional living accommodation, to ensure the floor has required strength for additional loads, the introduction of steel beams would be required. Replacement roof coverings are limited to the design weight and can't be exceeded. Only the materials specified for the roof covering can be used as the engineered trust rafters have been calculated specifically based on this product. If a new roof was needed in the future, the weight of material would need to be considered. As part of the engineering specification the roof structure would have been tested for instability and wind resistance to prevent uplift of roof materials.

Alternative Roof Structure: Advantages

An alternative roof would be to use a traditional cut method. The roof structure would be solid, generally over-engineered and usually last a very long time (depending on the quality of materials used), far longer than the expected life span of a current new build of 60 years using trust rafters. (planning portal, 2018). The appearance would be much nicer aesthetically and the structure could be left exposed as a feature. Any type of weathering could be used on the roof if a traditional cut method is used.

In accordance with part A Building Regulations 2010, a traditional cut timber roof, using joists, purlins and rafters should have sufficient built-in stability and wind

resistance, for example hipped ends. (section 2a – basic requirements for stability part a building regulation 2010)

Alternative Roof Structure: Disadvantages

The roof would be constructed on site with all timber work cut and built on site by a carpenter. The work is much slower and far more costly, and dependent on the ability of the carpenter and that of the site foreman, the quality of the roof structure is not as easily quality controlled. Timbers used on site can be stored incorrectly or be poor in quality.

Condensation & Ventilation

Sources of condensation

- Breathing: humans and pets create a large amount of water vapour. The average human creates around 5lt of vapour at night while sleeping and pets, especially dogs, can double that figure.
- Cooking: The introduction of more moisture into the atmosphere while cooking.
- Showering/bathing: The introduction of large amounts of moisture during this activity, in an average family of 4 showers/bath daily.
- Laundry/drying clothes: Whether this is done via a tumble dryer or manually on a clothes/air drier the additional moisture introduced into the atmosphere is high. Clothes left wet will have the moisture evaporate into the atmosphere.

Causes of condensation

- Poor detailing during construction, especially at junctions and panel joints, the installation of insulation and lack of taping joints can increase the rate of heat loss and cause cold bridging.
- Build up of mortar within the cavity due to poor workmanship can cause bridging.

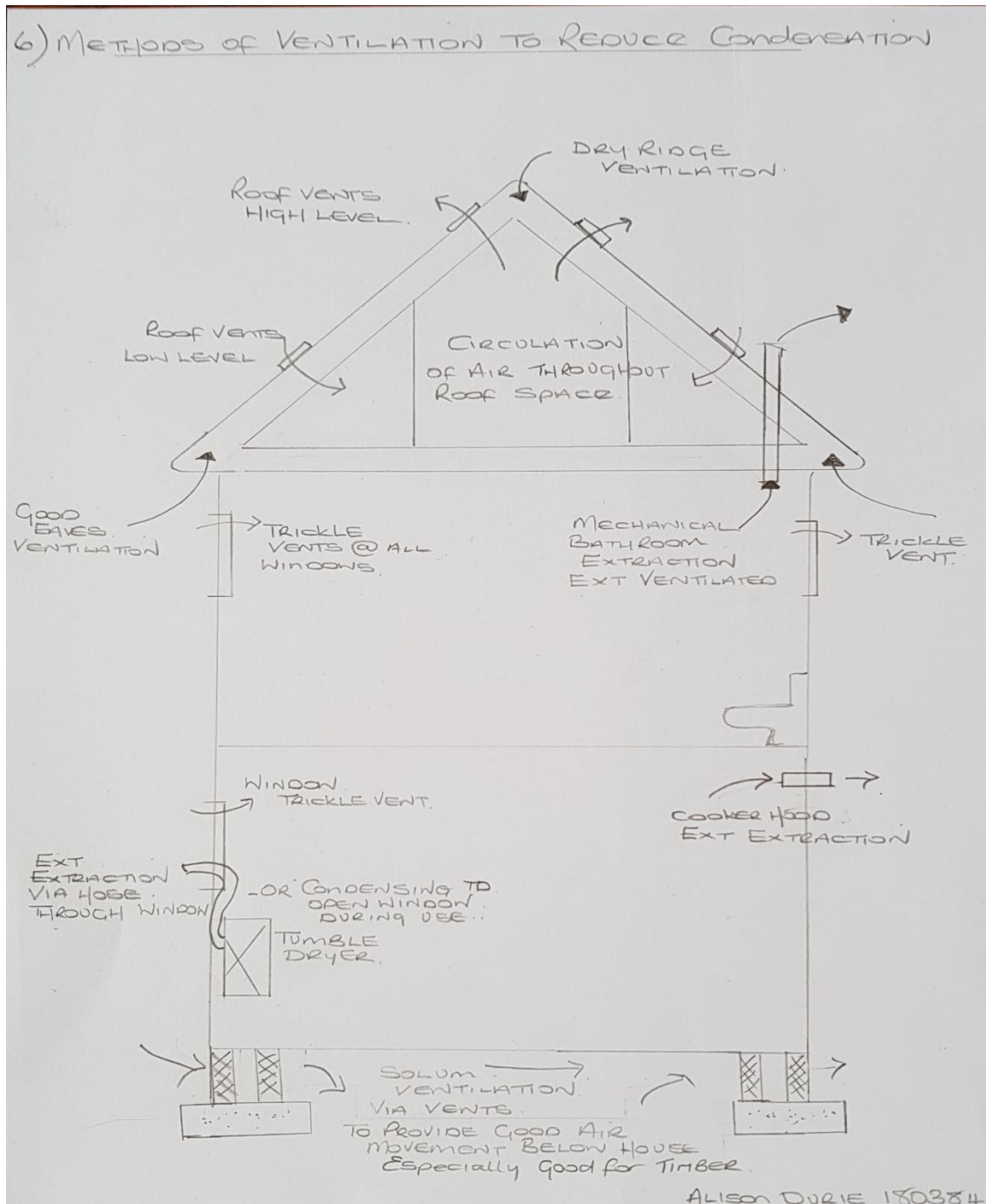
- Insufficient ventilation within a property, for example the lack of trickle vents in windows, or the occupier not opening windows.
- Insufficient or poor mechanical extraction throughout the building or occupier not using them.

Detrimental effects of condensation upon building fabric

- Increased risk of decay to some materials, especially timbers
- Dampness to fabric, for example plasterboard walls
- Staining to decoration
- Smells in absorbent fabrics
- Moisture bloom on surfaces
- Increased heat lost via the poor jointing/detailing
- Cold spots due to cold bridging
- Warm moist air attracts woodworm flies as they thrive in these conditions

Methods of Ventilation – New build

6) Methods of ventilation for new build - annotated sketch



Appendix 6 (original provided in hard copy submission Alison Durie)

Measures to reduce condensation

- Understanding the sources of moisture creation as discussed above.
- Encouraging airflow either by ventilation or mechanical extraction
- Leaving bedrooms doors ajar during the night and opening windows in the morning.
- Remove surface water from the shower cabinet to avoid its evaporation into the atmosphere.
- Wipe down any window with condensation using a dry cloth, remove the cloth and dry outside to avoid further evaporation into the atmosphere.
- Storage of any wet clothes, either just laundered or wet from outside, in a utility room with the window open.
- Use lids on pots and pans while cooking will reduce moisture vapour created as well as reduce energy used.
- Wipe moisture from microwave surfaces after use, using kitchen towel, and dispose of.
- Use good-quality, over-hob, mechanical extraction whilst cooking and continue to use the extraction for a period of time after cooking to remove any additional moisture left in the room. Alternatively install a mechanical extraction fitted with a humidistat that will operate automatically when the level of moisture in the room increases. These are generally recommended for use in kitchens. Bathrooms do not work especially well with humidistats as ventilation needs to be for dual purpose odour and vapour.
- Use a good quality mechanical extraction in the bathroom.
- If using a tumble dryer, vent to the outside at all times. If using a condensing tumble dryer or manual method of drying on an air dryer, ensure the room is well ventilated and a window is opened during the process as some condensing dryers still produce water vapour.
- Don't dry clothes on radiators as this allows the moisture to evaporate into the atmosphere and increase moisture levels generally and can cause dampness by condensation.

Additional measures to be considered in new-build to reduce condensation

- Using breathable membrane at the roof to aid air-flow.
- Installation of high and low-level roof vents.
- Good eaves detail with sufficient air flow or ventilated eave detail.
- All windows to be fitted with trickle vents and vents to remain open as far as possible.
- Good quality mechanical extraction in Kitchen and Bathroom areas, with minimum run on time of 20 minutes if possible. New builds require mechanical extraction to bathrooms, utilities and kitchen areas. Intermittent or continuous extraction can be used.
- Ensure that provision for tumble drying is in a well-ventilated room using a good quality condensing dryer or ducted externally.
- Keep bedroom doors ajar to improve air flow and air movement during the night to prevent build-up of moisture in the room.
- Limit the amount of clothes drying around the house and, if using an air dryer, ensure it is in a well-ventilated room.
- Do not use radiators to dry clothes as this produces a huge amount of vapour that will need to condense somewhere.
- Ensuring the building is well insulated and all detailing is finished off well to limit the amount of heat loss and cold bridging.

Appendices

Appendix 1: Strip foundation Cavity Wall Block & Block (annotation)

Appendix 2: Ground Floor Construction detailing & Junctions with External Wall sketch annotated

Appendix 3: First floor, construction detailing junctions with external walls and restraints

Appendix 4: Eaves detailing Roof covering sketch annotated

Appendix 5: The main roof structure, construction detailing and fixings

Appendix 6: Methods of Ventilation – New build annotated

Referencing

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