Problem Identification 1

Client Profile:

My clients for this project to be Mrs Nicola Westworth (age 48) & Mr Christopher Westworth (age 40), a married couple with three children, who are currently living in Irthlingborough, Northants, England. Nicola is a UK Ariel team manager (Agricultural Rural Industries and Estate Losses) for Crawford & Company. Manages a team of 22 people nationwide, from Newcastle to Exeter. 80% of her job involves travelling to these offices. She is a married mother with a full-time career but mainly works from home. She likes to keep close to local conveniences since she has a busy lifestyle. Christopher is a Calibration Technician at Lisi Aerospace. On a day-to-day basis he ensures that all measuring equipment and heating equipment are in the correct condition for the production of parts for passenger aircraft. But when off work, he loves mountain biking in the hills and keeps active outdoors. Chris likes to keep up with modern styles and technology, relating to their preference of a contemporary style.

Chris and Nicola generally have the same design preferences as each other. Collectively, they prefer a design that will fit into the landscape well and wouldn't want to produce an eye sore. They like to keep a contemporary style house with large windows and light woods e.g. Oak doors and wooden flooring. They like to keep a light and modern feel to the house with the inclusion of glass e.g. Large windows and a glass panel staircase (to keep it clean looking). Both would like to use reclaimed materials and energy save (low energy bulbs and possible solar power) , as they both care about the environment and like to recycle as much as possible. Preference to using natural materials and heat sources, “this keeps a cozy atmosphere and ambient lighting.”

Problems with Current House (Interview):

My clients have lived in Irthlingborough for the past 16 years, although though they explain that nothing is physically wrong with the house (it isn’t falling apart), they would like some change. It’s more of a luxury and opinion based change rather than a last resort / must-have change. There are a few minor issues for the couple that they wish to correct and start fresh in this new project.

The current house location is not ideal for the client preferences, they do not like the idea of living in an urbanised area / town. They wish to be located in a rural area in a quieter location. They are unhappy with the current area of Irthlingborough and wish to move away from the community surrounding it. They prefer the living style and community surrounding a rural location.

The current house, they explained that their house is not large enough and doesn’t meet the requirements of the expanding family. Three bedrooms with 5 total people is not a good thing. Bedrooms are having to be shared when possible. They would like to give every child their own room to live freely and comfortably. They would like to be able to fit all appliances properly in the kitchen to tidy up clutter. (Would like to have a generally larger living space).

The house was described to me as, “Not a good build” and “Not unique”. They feel as if the house is on too much of a slope and will become unsuitable to live in in the future. They also feel that the style of the house is too similar to all the others surrounding it and wish to have a more unique and interesting build rather than brick.

House Location in Irthlingborough

Current House Information:

The current house is a three bedroom detached house in Irthlingborough. With the address: 5 Scharpwell. It is a generic red brick build with almost the exact same design to the rest of the estate. Centrally located in the town.

Other features include: Three bathrooms (2 separate and 1 ensuite), a standard sized kitchen (4m x 3m), a standard sized living room (4m x 4m), a small front lawn (4m x 3m) and a narrow & downward-sloped north facing garden (4m x 12m), a garage of moderate storage (2m x 4m) and two separate sheds.

House Location in UK

Problem Identification:

Although there were past plans to build an extension to the ground floor of the house, the current planning permission doesn’t allow for an extension big enough to suit the needs of the clients. Since they need the extra space, the only other option for them was to move into a new house. They also see this project as a new opportunity to change their style of living and break away from the current repetitive lifestyle. “We would love to expand and live freely.

So, my clients overall reasons for the need to change house are: They generally don’t enjoy living where they do, they have lived in Irthlingborough for quite some time (16 years) and need a change of scenery (need to move away from the urban area to the countryside). As for the house itself; It is too small for the expanding & growing family, they are finding that there is not enough space to store new things and appliances, and when they want to expand via a house extension, they aren’t able to seek the planning permission. They don’t feel that the design of the build is unique and has no character to it.



Views of back Garden

House Front View

House Aerial View

Possibility of the Project:

The project will be to design a new house in the plot of land located and purchased by my clients in Hale, Manchester. The house will need to be seen as an improvement to the current property and work to eliminate the current problems listed earlier. This will be very possible to achieve since the site is in an improved area and with a larger area of land. The house has the possibility to be a large, 5 bedroom contemporary styled house in a way more original style than the current generic brick build in Irthlingborough. I can use more expensive / unique materials like oak and slate cladding (e.g.). They will be happier with the property location as well as the improved aesthetical features and be much closer to their other family in the Lake District, Which will ultimately lead to a better overall lifestyle for the family

Problem Identification 2

In Depth Client Interview:

During the client interview, I asked the couple to tell me, in detail, what they would look for in their new ideal house for this project. I also asked about the budget they are willing to work with as well as the site location they want.

Q: What rooms would you want to have in your new house? What sizes do you need?

- 2 Floors, (As standard for modern builds).
- 5 Bedrooms (4 with en-suites and 1 without), Will provide 1 bedroom per child and no sharing of rooms. One bathroom separate as there needs to be 1 bathroom accessible to guests. “Bedrooms need to be large enough to include double bed & TV”. Includes 1 master bedroom 5m x 5m. This will have a larger on-site with a large free-standing bath & shower
- Large Living Room, Enough to live luxuriously (“Space for TV, sofas, coffee table, various drawers/ottoman, wine rack as well as some space to spare for comfortable movement”) (6m x 6m estimate)
- Large German style kitchen, “we personally love the style and we think it will work well with a contemporary build”. Needs to include a breakfast bar / elevated seating. Preference for an island style layout (cooking area centralised). The kitchen should have large bi fold doors, would like them to open up completely to the garden / patio.
- Large separate dining room from kitchen, “We would like to fit an 8 seater table for dinner / entertainment for the family”. Similar in style to the Living room more than the kitchen.
- Working space needed / a comfortable area for home working “This is compulsory as my work requires me to have a home office”. Enough space for filing cabinets, fairly large desk / workspace & computer
- A small annex area for consideration of elderly relatives. “We like to have guests round often, we need a place for them to stay comfortably”.
- Large utility room, enough space to fit in all extras as well as tools. “We need all the clutter to be kept away in here, this is one of the problems we have currently”.

Q: What style of house would you like to have?

- Modern / contemporary style, avoiding a VERY traditional or stately home style structure. “However we want a contemporary meets traditional theme, so we do want to have some elements of traditional housing in the design.”
- Dislike the idea of old fashioned large archways or curves in the design, “we would like the main focus of parallel lines”.
- Traditional pitched roof needed, “we don’t like the idea of a flat roof at all.” Also would like to store things in an attic (maximise storage space).
- Would like lots of large windows (probably a half and half mix of Glass and Natural stone / grey slate) “Alongside the slate, we prefer light oak doors & garage doors. We really like this colour combination”.
- Would like to create a Modern, Light and Spacious style, “Not to the point where it is futuristic, but we will like to keep a partly traditional look as well to match the site location”.

Q: What materials would you like to use?

- We would like the main structure to be made out of a natural stone of some form, a light grey colour underneath, on top we would like to see some oak cladding (in some, not all places) on top of the stone to match the oak doors but being a slightly different shade, to give a variation to colour. Also have oak framed windows to avoid the use of white plastic on the exterior
- A lot of glass for large panes (preference for recycled glass).
- The roof would look nice in a darker grey slate colour, slate tiles or a look-a-like equivalent.
- Standard PVC for drainage, but in the same colour as the slate roof.
- Fibreglass for insulation since the stone bricks will allow a lot of heat loss.
- Traditional concrete base layer, but with the inclusion of recycled metal (maybe steel beams) to reduce the use of unsustainable materials.

Q: Will being environmentally friendly affect your choice of materials? Are there any other environmentally friendly aspects you would include?

- We believe that being environmentally friendly is important, but not going over the top We would like to have as many of the materials recycled or reused as possible. For example recycled stone or slate. Or wood form sustainable sources. Also materials shouldn’t be so strange or over the top that visual pollution is created to the area (no strange colours). Obviously we want no materials that are going to wrongly affect the environment or the habitats surrounding the area.
- Would love to have solar power, possibly solar panels on the roof to give sustainable, clean energy.
- If possible, a water collection tank would be nice to help out with water bills and reusing natural resources.

Q: What mood would you like to create?

- General relaxing mood with addition of ambient lighting for the interior, almost a cosy feel at night time.
- In the day time we wish to have as much natural light in as possible in order to create a light, clean and airy atmosphere

Q: What other features would you include in the house?

- We should consider a relatively easy access for wheelchairs for our elderly relative, no ramps but the front door needs to be close to ground level to allow for access.
- “We like the idea of a large garden, yet we don’t really care about detailed garden features for now. A nice patio area outside the house rear and a large grass area for children will be nice”.
- A south facing garden is ideal, plenty of sunlight into garden and house rear (kitchen). As well as maximising sunlight for the solar panels on the roof, keeping them cost efficient.
- “We would like to include under floor heating around the house”, since there will be plans to have hard wooden floors as apposed to a carpet. Will be especially useful for winter months.

Q: What do you need from a good plot / site?

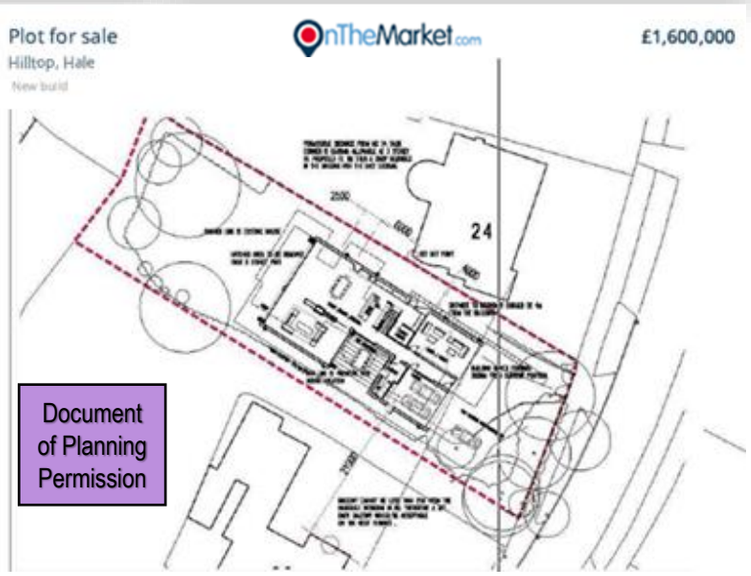
- Site limited to England, “to keep within reasonable distance to friends and family.”
- Would prefer to be inland rather than at the coast. “I don’t like the idea of living in a tourist town or city. Also the noise from the sea is unwanted as well as any noise from sea birds etc. This is one of the few features of the current house that we enjoy and we want to keep to the same”.
- A rural countryside location is ideal. “We want to have a relaxing and quiet lifestyle, free from the noises of the city as well as the pollution and community.
- “Wouldn’t like to live next to a river, there could be a giant flood risk. If near a river, we need to be situated on high ground”.
- Preference to living on the outskirts of small towns, so services are still available whilst still living rurally.
- All of these aspects are true to our current site plan we have selected.


Street View of Plot

Aerial View of Plot

Site Location:

My clients have purchased a very promising site location (plot of 0.35 acres or 1416sq.m) with current planning permission for a 5 bedroom, 5 bathroom detached house. (with total planning of 6500sq.ft or 6304sq.m). This fits perfectly for the current possibility of the project. For a reasonable price of £1.6M compared to the other plots available.
The plot is on the outskirts of Manchester, in the village of Hale. Hilltop, Hale WA15 0NN. This location meets all the client’s requirements: Rural location, Access to the services of Manchester nearby without having to be amongst the masses, not next to any rivers (within 1km of River Bollin).



Document of Planning Permission

Problem Identification 3

Research Plan:

Foundations:
- I will need to look at how far down housing foundations need to be to meet todays building regulations.
- What are the most effective materials for housing foundations? How environmentally friendly can I make it?
- I should know what the soil type is for the village of Hale, I will research this in order to know how far down to dig for the foundations.
- Cost of the foundation materials

Materials / their Effect on the Environment:
- I'll need to research various building materials for the house based off of my clients needs and wants
- I should assess the different materials I will use for my house, to see where they are sourced from and if they are environmentally sustainable or not.
- Assess advantages and disadvantages of the materials and appliances.

Cost of Materials:
- After choosing a material that will be suitable for the project, I should then search for the lowest prices, or if the material is too high in price, find a visually and functionally identical material (substitute).
- Research inexpensive materials to keep the construction project within budget without sacrificing quality.

Time of the Year to Build:
- Bad weather conditions could risk the foundations not drying properly, concrete will not set in very cold weather conditions. In wet conditions the ground can become sodden and can become difficult to excavate material.
- Need to find the best time of year to avoid heavy rainfall, snow etc. so construction can run smoothly and safely.

Planning Limitations / Orientation of the House:
- Will need to find out who the local council is for the village of hale and what they will and won't allow me to do when asking for planning permission, to keep my design suitable for construction.
- Check if there is suitable access to the plot from he street and see if one will be constructed E.g. Tarmac or block paved driveway instead of a dirt track.
- Check any fees for gaining detailed planning permission and consider this within the budget.

Sustainability Appliances:
- Should research what environmentally friendly appliances would be suitable for my project, e.g. Solar Panels, Rainwater collection systems, Wind Turbines…
- Assess how much money each appliance could save each year to reduce my clients bills as well as the payback time for each and assess if they are worth installing or not.

House Insulation / Waterproofing:
- Research how a wall is constructed, and how to install cavity wall and loft insulation as this is a vital element to trapping heat.
- Look at what makes up cavity wall and loft insulation.
- How to waterproof houses, how to waterproof materials (the oak cladding, walls roofing etc.), also what to use to waterproof.
- Research plumbing and electrics as well as the cost to do so.

Planning Limitations / Considerations:

- The house's design shouldn't be too over the top compared to the other houses in the area, meaning that the colour of the house should remain natural (e.g. Don't paint the outside walls pink). So the materials should remain natural / traditional to housing in that area.
- The house shouldn't overhang into a neighbours land area (house should keep to the plot and don't build outside of the given area).
- The house shouldn't change the function of the land, which I won't be doing since the land was previously used for residential.
- The windows of the house shouldn't face directly into someone else's property for privacy reasons, also there shouldn't be two adjacent windows on houses next to each other so that people cant see into each others houses. Bathroom windows should be opaque.
- The house will need to have a garage or reserved parking spaces inside the property / a driveway. To make sure that cars aren't parked on the kerbs outside causing disruption. There should also be suitable vehicle and residential access to the building through the form of driveways.
- The house needs to conserve the natural vegetation in the area and not destroy local wildlife, although this isn't so much the case in the residential area of Hale. This increases the houses sustainability.
- The height of the building should be similar to the other buildings in the area, shouldn't be very much taller than the others.
- The building should be set back from the plot boundaries at ground level, to prevent fire hazards and water runoff from the roof onto other properties.

Summary of Client's Issues & Possibilities:

The main issue of the clients is currently the house size & style as well as the location and the community surrounding the house. There aren't enough rooms in the house and the rooms that are there aren't big enough. The mood of the house is non existent, with no character or uniqueness (as stated by the clients themselves)

Now with the new site location in Hale, Manchester, there is a good possibility to expand the client's living space by building more and bigger rooms. To build an included double garage as well as an Annex area & dining room on top of the standard rooms of the current property. To also give an expanded front and back garden to host various events & gatherings for friends and family. Whilst providing the better community and environment of Hale.

The opportunity arises for me to start from scratch and be able to provide the character of the house; meaning that I will be able to create the light, clean, modern & contemporary style that the current house lacks

Contemporary Style

Materials

Window Designs

Modern Interiors

Barn Conversions

Task Analysis:

Potential Design Analysis

Materials

The house's foundations should be made from steel and concrete. The concrete is a standard requirement but the steel is a stronger reinforcement and should increase the house durability

Adding recycled steel to the foundations will also reduce the amount of concrete needed to fill the foundations, so meaning less non-sustainable materials are used, meaning better for the environment.

All flooring should be a darker hard wood, a preference over carpets for my clients.

Cost efficient materials need to be selected wherever possible to reduce construction costs. To compensate for the expensive land.

Use of sustainable materials such as reused slate, or recycled polymer equivalents, Oak from a sustainable source (FSC approved) will reduce environmental impact of the project. Keeping my clients care for the environment.

Recycled PVC for drainage, will be same colour as the slate roofing

Needs to have a sustainable and solid base layer, preferably a sustainable equivalent to concrete through the form of reinforced steel (recycled)

Recycled fibreglass for inside walls & roof (create cavity wall insulation – mandatory) cost efficient and less heat loss, and prevents house becoming damp.

Materials need to be selected properly, materials that are durable in all weather conditions to lead to a long lasting structure with little replacement over time. Also decreases use of more materials.

Environment & Sustainability

The whole project should aim to make the house as environmentally sustainable as possible with the materials as well as construction methods

Design shouldn't look over the top, keeping a natural look will reduce visual pollution to the area and fit in with the countryside as well as other housing designs. (No overly exotic or out-of-the-ordinary colours)

Solar panels fixed to the roof and south facing to generate as much solar power as possible, renewable & clean energy. (Possibly solar water heating)

Include a rainwater collection tank with filtering, to supply to any suitable appliances. Save on water bills.

Form

The natural stone bricks should be light grey limestone in a more course rectangular block pattern (not the whole wall made of stone to save money and improve heat conservation to allow for cavity wall insulation).

The design should consist of mainly parallel lines, with no archways or classic design curves.

Make sure to avoid small circular windows, as my clients do not like this idea at all. (Don't let enough light in).

For design preferences, Natural stone bricks should be used for the exterior walls, would blend well with the slate roofing.

The exterior of the property needs to be natural looking with a light oak colour being the major material for walls and doors. (Oak cladding on top of the stone)

The house will need to have many large windows, fulfilling my clients specific requests for a light, airy and open house style.

Therefore leading to the request of bifold doors to compliment the large windows and open up in the summer. The large & parallel windows will lead to a contemporary look.

Main style of the house needs to be contemporary, not to the level of being very futuristic. But a nice middle ground between traditional and new.

For the exterior of the house, the form and design will be the main focus rather than the function of being environmentally friendly. Whist still keeping to building regulations.

The roof needs to be a pitched roof, to give a traditional element to the house amongst the other contemporary features

The roofing needs to be in a contemporary / classic crossover style. With a grey coloured slate look, whether it be real slate or an equivalent.

Pitched roofing will provide a good place for solar panels and maximising sunlight. Will also allow for extra roof storage (very much needed by my clients)

The overall shape of the house should be more than a square or a rectangle, as this is what my clients don't like about their current property. (Structure needs to be unique).

Rooms & Sizes

Needs a small room for an office area / general study room, with enough space for a desk as well as document cabinets.

A small annex area will need to be included, using one of the bedrooms and bathrooms

Internal garage for safe storage of the client's cars as well as various tools and bikes.

Will need 5 bedrooms so one for every child and plus a guest room. One bedroom needs to be a large master bedroom for luxury.

Needs to have at least 4 bathrooms. Full use of the "5 Bathroom" planning permission (allows most bedrooms to have en-suites).

To give a suitable area for the clients working or study (Official approved office area for Nicola as well as a general study room for the children)

2 bathrooms need be large enough to fit a bath, shower and toilet, for daily convenience as well as providing the correct facilities for frequently visiting family.

Function

To also provide a suitable home for an elderly relative with all the required facilities

When talking about the size of the house and all the rooms that will be included, this is the main focus as apposed to the form & looks due placement of the rooms.

To also have a large back garden for the hosting of family gatherings, the land area is large enough

Hose should be built in a slightly elongated shape in order to fit the plot well and maximise house size

A new and improved house for 5. My client's main daily living space. So will need to include all the key elements of a fully functional household.

Around a 6m by 6m Living room, enough space to fit furniture as well as enough space to move around comfortably

Kitchen at the rear of the house, with the bifold door to let as much natural light in as possible, should connect to the garden as well as the dining room, for options of where to eat in both summer and winter

The level of production will be that this is a one off property designed specifically for my clients and won't be replicated elsewhere

Flooring in the living room and kitchen / dining room should be underfloor heated to prevent heat loss and cold floors in the winter months

Land Area

There is currently good accessibility to the plot, since being part of a street.

Land cleared of all obstructions, also the land is at no risk of flooding due to the plot not being next to any rivers (over 1km away from the River Bollin).

The plot purchased had been previously used for other housing. The land area is already in optimal condition for the construction of a new property (since it was suitable enough for the last property), so no further changes are required.

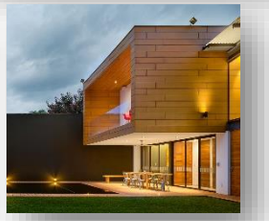
Although there is a current detailed planning permission for a set design, this is not what my clients want and need to seek detailed planning permission based off of their needs and wants. I need to seek the new planning permission form the Trafford Metropolitan Borough Council (local council for Hale).

Site has already acquired the outline planning permission required to build a 5 bedroom, 5 shower/bath rooms house, with a maximum total property area of 6,500 square ft. out of the total 0.35 acres of land.

Existing Commercial Product Research

ALD House Located in Cuernavaca, Morelos, Mexico, This is a house that uses the typical new and modern, contemporary style. Although this is not the exact style that I want, there are some elements that I would wish to use.

One of the main features of this house that caught my eye was the very large windows covering almost one complete side of the house, although I believe this to be a little over the top, I think this could be a worthy addition to my own design. As previously mentioned, my clients said that the south facing exterior of the house should have a very open back to it in order to let a lot of sunlight into the kitchen. I may include this feature but keep it to one floor and have smaller windows. I also noticed that the walls are wood cladded including the large protruded top floor section, which creates a very clean look to the exterior, also another element that wish to include in my own design. There is a nice solar shading roof (where the roof extends past the walls of the house) to prevent too much sun from entering the exposed side of the property, to control the light levels during the day and to also limit the wind that can blow round to this area near to the table and chairs. Especially with a south facing exterior, I should consider adding this to my design. The large top floor extrusion creates a nice shade for the table and chairs below and is also a very unique design feature, although this is a very expensive way to do so, in my design I would prefer to have a porch.



Client opinion: Overall we don't like the style of this house very much, the large blocky balcony is not to our tastes, especially the way to protrudes outwards. We prefer a pitched roof rather than a flat one, because here the house looks too flat and blocky. We do like the wood cladding around the exterior, as it gives a nice variation to colour.

This contemporary bungalow is obviously not the suitable house for my clients, but there are some very good design aspects of this house which I am considering adding to my own.

The first thing I noticed is that the solar shading roof idea is again in use, it successfully keeps the sun out of the main front room of the house which is exactly what I want. Despite having a pitched and not flat roof plan, I still think this aspect can be implemented. The protruding garage out from the house front is very unique and good looking, giving more of a unique shape to the house and also creating more of an enclosed central area in front of the house. Considering that my clients are looking for more of a unique shape, this could be a good option. The many large windows are what's creating the contemporary look here, but what balances it out are the more traditional looking stone pillars separating each set of windows. This is a very well executed way of crossing new with old, which is also what I am wishing to do in my own house design. The pillars are further forward from the main wall, which also creates a nice depth to the front, making it seem more detailed and interesting compared to a flat brick wall. Also giving a larger range of colours and materials to the build, keeping it interesting. The long band of wood cladding around two thirds of the way up separating the top and bottom windows could also be affective for separating top and bottom floor windows. The only clear downside to this property is the lack of height, although here this is intended, applying these features to a two story building will work really well for my clients.

Client Opinion: The nicest feature about this is the stone pillars along the front. The stone blends together well with the wood cladding. It seems to look like there are oak framed windows here which are very appealing to us as there is now a very nice colour variation. Again, the flat roof is not for us as the building isn't tall enough

This natural stone, barn conversion styled house located in Denmark is a very good example of the contemporary crossed with traditional idea, with the traditional side in this case being an old barn house. I chose to showcase this house because of how similar the materials and colour scheme are to my upcoming design ideas in my head.

The house is a very elongated shape with a large pitched roof running the whole length down, this had the potential to be very boring but the interesting feature is the way that the roof hangs over the front of the building, again creating a nice solar shading feature seen before. The entire front of the house is covered in large windows in an offset modular arrangement, this is quite unique and certainly more visually appealing than regular square windows. I am strongly considering this for my future designs, as it adds an extra layer of design complexity. The whole design allows a lot of natural light to be let into both floors of the house but decreasing the direct sun glares, decreasing light energy bills. The glass panel topping to the front wall is also very contemporary and clean looking, allowing a greater deal to be seen out of the front room and vice versa. It adds an extra feel of protection without hindering the ability to see out, and not crating a feeling of being trapped in. The internal layer of the over-hanging roof is wood cladded and compliments the outer stone well. Interestingly, this house uses a Thermoslate roof system (natural slate solar panels) which is including my clients desired roofing material whilst saving huge on energy bills and being environmentally friendly.

Client Opinion: This is easily our favourite design, we love the elongated barn conversion style here. We think that this house has way more character than the previous 2 designs. We found the Thermoslate to be perfect for us and we really love the idea. However there is too much of the same colour, we feel, since there is to much grey and could be improved with some oak cladding. The windows are also too small round the sides but we like the unique design of the front window arrangement.

This very large private home located in Mulay, France is the least contemporary design out of the four, there are some very interesting traditional features that I wish to take away from this design, to infuse with contemporary features in my own future designs for my clients.

This house has all the correct materials for the design that I will be going for, the natural slate roof and the outer wall being all wood (although this is a bit excessive in this case it still looks very visually appealing and well suited to a rural location). The centre piece to this design is the large open porch / seating area in front of the building. This seems like a brilliant design idea to host family in the summer and have outdoor gatherings like intended, since there is enough seating here. The area is well sheltered since being fully integrated into the structure, the roof slopes around in a quarter octagon type shape which is very unique. It is being held up by five large wooden supports which also look very clean and stylish with the way they split off into three separate branches. The way that the garage to the right is a single story protruding section to the building is very much to my client's tastes as it doesn't take up space in the main structure and also adds unique design complexity.

However the main shape of tis house is not the style that I am going for since it very wide and almost circular in some areas. The windows are also too small and there are too few of them. This will not be letting enough natural light in during the day and will force more use of interior lighting. Also am looking to stay very clear of small circular windows.

Client Opinion: This house feels like the cosiest and most inviting house here. We love the porch idea at the front as it is very unique. However we think that there is too much wood used here as it creates too much of the same colour. We dislike the idea of a more circular house in this case. Also the windows are way too small and there are too few of them.

Research Investigations 1

Bifold Doors

Bifold doors are a form of sliding door that are usually split up between 2 and 7 tall rectangular panels of glass. They are mainly used for back doors, such as an entrance to the garden or conservatory. The panels are connected by hinges and are attached to rollers to allow them to be opened, they work by sliding the panels across a track and they neatly stack against the wall to the side.

Bifold doors are often included in contemporary designs due to their large panes of glass as well as the light and airy atmosphere they create. This door is suitable for all seasons, since one of the panels will act as a normal single door (called a traffic door) you are able to enter the garden in the winter months without having to slide back all the panels and letting heat escape.

Advantages of Bifold Doors:

- Their main idea is to let as much natural sunlight in as possible, which reduces the need for internal lighting in the day.
- Also the large panes and the thin aluminium frame allow good views outside with little obstruction. Can also give the illusion of extra space in the room
- The large unobstructed opening space can allow for ease of access to the garden for multiple people at a time. On the other hand the single traffic door provides ease of access in colder months. Also can be seen as more aesthetically pleasing than a smaller single door.

Disadvantages of Bifold Doors:

- Since the doors stack at a 90 degree angle to the wall, a little bit of space needs to be kept free either side of the door to allow them to stack.
- Bifold doors are very costly compared to the traditional single door, costing thousands of ponds more. However, when on a large scale, can price up cheaper than sliding doors due to the smaller panes.

My Use:

I am hoping to use bifold doors as the back door to the house, so it can open up the kitchen to the garden out onto some decking. To let lots of light into the exterior and allow easy access to the garden when having guests round.

Timber Cladding

Cladding is a facing material that acts as an extra exterior layer to the building. Long, thin planks can be fixed directly onto the wall or can be nailed onto timber battens (thin vertical planks), the cladding tends to be tightly packed together (for waterproofing) in either a horizontal or vertical arrangement. So the cladding can used alongside the base layer in specific areas to add layers and complexity to a design as well as provide a mix of natural colours on the surface. Large or continuous waterproof membranes will need to be installed behind the cladding to prevent water from entering behind the timber and causing issues. Since the cladding can be any shape or size, any grain or species of wood this allows for a huge range of potential designs, textures and colours, including: Oak, Teak, Pine, Beech etc.

Advantages of Timber Cladding:

- Is seen as a cost effective process, due to the lighter weight of the wood compared to other construction materials, the installation process is fairly fast because the materials are easy to handle.
- Is an environmentally friendly material (when taken form the correct sources) as wood is a renewable resource, 100% recyclable and easier to obtain compared to other materials.
- The timber tends to have good sound absorption properties and can be very noise cancelling from the outside.
- Various grains and colours available to meet almost any design, so is very versatile. Can also be trimmed easily into any size or shape.

Disadvantages of Timber Cladding:

- The wood has a tendency to expand and shrink between changes in temperature as well as changing between wet and dry conditions. Should be taken into consideration when fitting.
- Requires more maintenance compared to other materials, as the colour can fade over time as well as be subject to natural weathering. Preservatives / paints need to be applied around every 4 years to keep in good condition.

My Use:

I will clad some areas of the exterior house walls, to go alongside the underlying stone layer. The grey mixed with light oak should go together well in a half stone, half oak style. The cladding could line the windows or line the roof (to separate the stone from slate)

Thermoslate

Thermoslate is described as a range of solar thermal collectors, so they act and work the same way as a solar panel. Absorbing light and energy from the sun during the day and converting that into renewable energy. 1m squared of Thermoslate can heat 50 litres of water as well as preventing the emission of 90KG of CO_2 per day. Can save around 400L of central heating diesel oil annually. Equating to 1.1 tonnes of CO_2 prevention per year.

There is usually 1m squared of active solar collecting slate tiles that are connected to provide the energy. However the surrounding area is covered with non active slate tiles, purely to fill the rest of the roof and look the exact same as the active tiles. Since the main component of the Thermoslate is natural slate, this is very good for my clients since this provides a renewable alternative to the main material request of having a slate roof. I will only be using Thermoslate on the roof as this is the place where the most sunlight will hit. Having the material anywhere else will not be very cost efficient.

Advantages of Thermoslate:

- The main job is to provide renewable, clean and environmentally friendly energy to be used in any way around the house.
- The material is waterproof (as it needs to be as a roofing material) as well as very durable and high strength. So won't need to be replaced over time.
- It is as if the solar panels are hidden into the material, so there is no need for large, unsightly solar panels on the roof. So looks more aesthetically pleasing and takes up much less space.
- Very fast installation time of just 3 hours, so will take less tie to set up than traditional solar panels.

Disadvantages of Thermoslate:

- Although the Thermoslate will generate enough energy to significantly reduce energy costs, for a large house there will still be high annual energy costs. Since Thermoslate doesn't provide enough energy to power everything in the household.
- A fully functional Thermoslate system has a very high initial cost and very few people can afford the investment. The payback time can be around 5 years (minimum) before any money is saved.

My Use:

This will be my primary roofing material, to provide a sustainable and eco friendly alternative to natural slate whilst still having the same aesthetics but having the extra use of integrated solar power to save using solar panels.

Research Investigations 2

Under Floor Heating

It is a system mainly for hard flooring materials, to prevent the flooring from becoming too cold to walk on comfortably. Underfloor heating can be used to replace some radiators around the house, since the heat rising from the floor will rise to heat the whole room. As well as the main selling point being the comfortable warm floor to walk on.

There are 2 different types of under floor heating systems: Wet and dry systems.
A wet system is one that runs hot water pipes under the floorboards (are thin and flexible like a hose pipe). The boiler heats the water in the pipes, the heat from the pipes then transfer heat the the floor boards.
A dry system is one that runs electric coils under the floorboards, when they are turned on, the electricity passing through the coils transfers heat to the floor boards.

Advantages of Underfloor Heating:

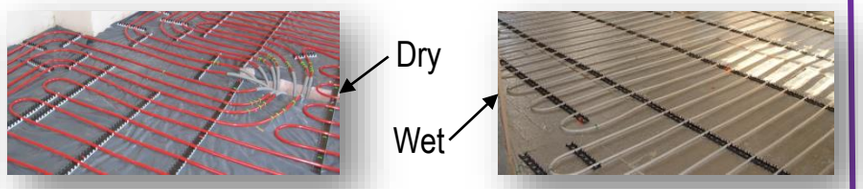
- Underfloor heating is the closest thing to an ideal heating system, the temperature is higher in the bottom half of the room, where people are. Whereas with radiators, they heat the top half of the room mainly leaving the lower half at a lower temperature. Not as efficient.
- Under floor heating doesn't leave any cold or unheated spots in the room, the whole room tends to be an equal temperature. Unlike radiators where they heat the air closest to the first.

Disadvantages of Underfloor Heating:

- Whilst installing a dry system is less expensive than a wet system, the electricity costs way more to run compared to heating water with a boiler. Will result in very high electricity bills. However in the long run, will have lower running costs.
- When using the wet system, there is always a risk of a water leakage, if that happens, then the whole floor will need to be removed to fix the issue. Which would be very costly.

My Use:

My clients wish to have hard flooring in every room of the house (no carpets), so I would install under floor heating in all of these rooms, with the exception of small storage rooms or the garage. I will install a dry system to avoid the risk of water leaks and the need for repairs.



Rainwater Collection System

This system consists of a water collection tank as well as some piping to and from the tank(s). The idea behind this process is to utilise the wasted rainwater that runs into the drains. The water is collected by the roof guttering and runs down a pipe into the collection tank. Here the water is stored and the impurities are filtered out (rainwater is passed through an internal filtering system). The water is then stored to be utilized at a later point, the water could be run to any appliances e.g. dishwasher, washing machine etc. or even to be used as drinking water or for irrigation if needed. Tanks can come in a range of sizes from around 20 litres to around 1000 litres, depending on the use or level of rainfall.

This is an efficient method since the roofing of a house is a very large area for rainwater to fall onto, so in climates with high rainfall, water bills can be significantly reduced.

Advantages of Rainwater Collection Systems:

- It is one of the easiest ways to be environmentally friendly as well as reducing water bills.
- Versatile water use after collection, cleaning cars / bikes, water for appliances
- The system is easy to maintain, since it is a simple concept and doesn't require any advanced technology.
- Simple technology means that the system doesn't cost a lot to buy and install.

Disadvantages of Rainwater Collection Systems:

- The level of rainfall is unpredictable and uncertain, so in summer months where there is less rainfall, the system could become redundant and not save any money.
- Also if there is too much rainfall, then the system could overflow, an overflow pipe will need to be installed.
- High initial cost of between £200 and £2000, the payback time could take around 10 – 15 years.
- Regular maintenance needed, due to possible algae growth or breeding of insects over time.

My Use:

There will be a rainwater collection tank at the side of the building, most likely coloured grey or dark grey to fit the colour scheme of the house and not look out of place. It will store around 200 litres maximum to be used for cleaning and water for appliances.

Limestone Bricks / Cladding

Limestone is a natural stone mined in the UK, this is another base construction material, commonly used as a traditional building material for the exterior walls of housing. Through the form of pale yellow or light grey (most commonly). Limestone is very rarely used for the whole wall, the bricks or blocks are usually built up in front of the underlying layer of wooden studs and insulation / vapor barriers. Therefore giving the illusion of the full wall being stone but using less of the expensive material.
The stone can come in a variety of finishes, such as larger course blocks, squared, random or polygonal rubble. Giving a more aesthetically pleasing exterior rather than the uniform brick pattern. My clients have previously stated that they want the more course block pattern.

Advantages of Limestone for Construction:

- Limestone is seen generally as a very aesthetically pleasing material as well as it being more unique and traditional compared to brick, especially in my clients point of view.
- A lot more weather resistant compared to most materials (e.g. Wood), also doesn't corrode and is fire very resistant. Stone can be a very sound absorbent material (good sound insulation).
- Limestone is a very readily available material and has great structural advantages such as its high strength and durability, can be further increased with steel reinforcement.

Disadvantages of Limestone for Construction:

- Limestone and mortar slowly reacts with the carbon dioxide in rainwater and can slowly wear away over time, whilst this isn't a major issue, the gaps between the bricks may need to be "pointed" or filled in over time.
- Limestone needs to be mined and is not a renewable resource, meaning that the construction will have a bad environmental impact if recycled limestone is not available at the time. The mines are also unsightly and the mining process will pollute.
- When on its own, any stone for a wall will not be very poor for heat insulation, so some underlying layers of studs and cavity wall insulation will be needed.
- Cost of limestone is high, around £7 per square foot. It is also a heavy material and can be difficult to work with for construction.

My Use:

Limestone will be the main material for the outer layer of the building, I will be using lighter grey limestone in a course / large block formation. Will compliment the oak cladding on top as well as the Thermoslate roof.

Research Investigation Summary

I will be looking to implement each of these six elements into my house design in order to create the best design possible for my client, I will try to include as many needs and wants listed as possible starting with these items:

Bifold Doors:

I have established that bifold doors are a great addition to a contemporary home, they are stylish, modern and really allow a lot of natural light into the exterior rooms of the house. This is exactly what my clients have asked for, so I will include at least two bifold doors in my future design. Bifolding doors will be great to open up the kitchen to the exterior decking for in the summer time for easy access as well as opening up the house to the outside air. Ill need to make sure to keep space free either side of the door to account for the door folding.

Timber Cladding:

Upon researching timber cladding, I know that it is a simple way to give a house an expensive and contemporary look. The cladding will break up the design and provide a different colour / texture to the outside walls. This will be perfect for my future design as this will allow me to get the contemporary look my clients are asking for, I will use cladding alongside limestone bricks to get an old-meets-new style. However, when choosing the right cladding, I will have to keep in mind that cladding has to be replaced more often than other elements of the house, so it shouldn't be too expensive and I should install waterproof membranes behind the cladding to attempt to prevent rot as quickly.

Thermoslate:

By researching Thermoslate, I found out that it is way more environmentally beneficial than I first thought; it can heat roughly 50 litres of water per day and prevent the emission of around 1.1 tonnes of CO_2 per year. This will please my clients as they wish to be as environmentally friendly as possible with this project. The Thermoslate replicates the look of regular slate almost perfectly, this is good since my clients wish to have a slate roof but don't want it covered by an unsightly solar panel. I learnt that the system is quite costly however.

Underfloor Heating:

I now know that there are two main types of underfloor heating, a dry system and a wet system. A wet system involves running hot water though underfloor pipes, this is cheaper to use however if the system fails then water could leak and cause a lot of damage to the house. A dry system involves heating insulated copper wires, whilst being more expensive, when it malfunctions there will be minimal damage to the property. Underfloor heating is very suitable for my future design as I will try to have laminate or wooden flooring in most rooms, to keep the floor comfortable to walk on in the winter, I'll install underfloor heating in most rooms.

Rainwater Collection System:

I now know that a rainwater collection system takes in water from the gutter run-off when it rains. Then it filters the water, stores it and then allows you to use the water for cleaning / washing etc. whenever you need it. This can be useful for my clients to reduce their water bills each month however the initial cost of installation means the payback time of the tank will be between 10 to 15 years.

Limestone Bricks:

I've found out that limestone is an aesthetically pleasing and valuable house finish to a high value house. It will be sourced and cut in the UK, it has a pale yellow or light grey colour to it and is excellent at giving a traditional look to the house. This is really suitable for my build as it will give a traditional element to the old-meets-new style ill be going for. I have kept in mind that limestone is very expensive as well.

Life Cycle Assessment

Bifold Doors:

The bifold doors I will be using will be made from fibreglass frames with panes of double glazing glass. Fibreglass is a reinforced plastic material which is composed of a woven material that is imbedded with glass fibres. The raw materials include: Silica Sand, Limestone and Soda Ash. The glass for the panes will be made from liquid sand which is heated to 1700 degrees Celsius. The production of the panes is sustainable as no high value or rare resources are being used. Once fitted, the bifolding doors aren't likely to need replacing in the near future as their lifespan is extremely long. Individual panes can be replaced, so the whole door won't need replacing. At the end of the products lifespan, glass is very much recyclable, the panes can be melted back down into a liquid and cooled for another product (Which is very sustainable as no new materials are being used).

Timber Cladding:

The oak will be sourced from a Forestry Stewardship Council approved forest, meaning the collection of the raw materials (Oak wood) will be sustainable since each tree that will be cut will be re-planted shortly after. The wood will be cut into the cladding and installed on the outer walls of a house, the cladding will often last for over 20 years but will likely need replacing due to water damage and rot over time. This can be helped with installing a waterproof membrane behind the cladding to help prevent rotting from behind. Once the cladding has served its useful life, it is biodegradable and will rot eventually, meaning it is sustainable and will not clog up landfill in the future.

Thermoslate:

The natural materials involved in a thermoslate system is mainly natural slate. Meaning the slate will be mined and produced into shingles. The job of thermoslate is to act as a solar panel without giving the appearance of a solar panel. So will absorb natural light in the day and store the energy. Thermoslate has an approximate lifespan of around 200 years, meaning once it is installed, you wont likely need to replace once you install it. It is sustainable in the sense that you will not need constant replacement which will use up more natural resources. Once the product comes to the end of its life cycle, the slate shingles can be detached and reused again for various other purposes in the future, meaning thermoslate continues to be sustainable even past its life.

Underfloor Heating:

The raw materials involved in the wiring under the floorboards are copper and a fluoropolymer insulation, the copper will be mined and sourced naturally, however this is cladded as a valuable and precious resource so isn't sustainable in this sense. The lifespan of the underfloor heating is marked between 50 and 100 years so you will not need to replace this system very often and it will be using up very little resources. The fluoropolymer insulation is classed as a thermoplastic meaning it can be melted down and recycled at the end of its useful lifespan, making it very sustainable and ready for further use. Copper can also be recycled afterwards meaning less resources are used up yet again by future products.

Rainwater Collection System:

A rainwater collection tank is made from Polyethylene so will not be sourced naturally, meaning it will be man made in a factory which isn't good for the environment and isn't sustainable for the future. During its useful lifetime, the rainwater will be collected from the gutters, filtered and then used in the house for washing and possibly outside uses. This then reduces water bills and the need to use new / fresh water, which is more sustainable. The tank also lasts for a very long time so you will not need to replace it often. Polyethylene is a thermoplastic meaning it can be melted and recycled after its use (very sustainable).

Limestone Bricks:

The limestone will usually be sourced from mines, which isn't sustainable, however the bricks I will be using will be reclaimed bricks from knocked down structures. This means bricks are being re-used rather than being manufactured especially for the project. The bricks will last for an extremely long time and the structure will last just as long, so no need for replacement at all. If needed the bricks can be preserved ready for a future build also meaning no new limestone needs to be mined again, making the project sustainable in that sense.

Specification & Refined Design Brief

Design Brief: To design a new, contemporary styled house for my clients: Nicola and Christopher Westworth, on the plot of land chosen in Hale, Manchester. The house will need to be in a more contemporary and unique style to my client's current property in Irthlingborough, since they are unhappy with their current property and have grown tried of the generic brick build style. I will be considering my client's tastes by basing the design around the materials of light grey limestone and darker grey slate, as well as including large windows and light oak cladding for a bright and airy feel. The house will need to work on the many flaws of the Irthlingborough property by: Including more bedrooms and bathrooms to provide for the growing family, which leads to the need of larger house generally to be able to store all the client's valuables and decrease clutter. The house also will need to cater for the client's expanded family when holding events or gatherings. Most importantly I need to create a design that my client's are happy with and are willing to live in throughout their retirement.

Product Specification:

Function:

- The house should be large enough to allow the family to move in and feel comfortable in. As well as have more space for storage and for everyone to have their own personal space (one bedroom each instead of sharing). On top of that an extra elderly relative will be moving in so Annex / extra space required also. I will speak to the family to see if they will be comfortable living in the house that I design.
- The house needs to be built in a rural area that is more relaxing and quiet than Irthlingborough (requirement already met since my clients are happy with the plot chosen). My clients need to feel like they can retire here.
- The house should include environmentally friendly appliances / elements to meet the client's wishes to consider the environment. For example the Rainwater Collection system, solar power etc.. I'll carry out visual checks to see if these systems are in use and functional.
- The house design needs to be the correct shape in order to fit the plot, since the plot is in an elongated shape, so should the house in order to maximise the house size possible. Due to general construction rules and planning permission, the house shouldn't extend out past the given plot boundaries into someone else's property. I will check the orientation of the house as well as the design prior to construction.
- The house should have a pitched roof for plenty of storage space (an attic can be utilised) as well as some form of storage room to keep the clutter out of the other rooms. I will make sure to dedicate space / a room for storage as well as have a large enough garage.

Form:

- The overall look and design of the house should be unique and use more unique materials to cater to the family's need for change, so include no brick or generic modern build house designs. (Be a more unique shape than a square and must give depth to shape and design).
- The house should be designed with many large square and rectangular windows, not so the house is made from all glass, just so that there aren't any dark rooms or large walls without any natural light coming in. Since that my clients want a light and airy atmosphere in the house with plenty of natural light. Make sure that all sides of the house have at least 2 or 3 windows of different sizes. Ill also make sure to avoid using small and circular windows on the design, since my clients really don't like this idea.
- There should be a variety of different colours and textures on the exterior walls of the house, to give the design an attractive look and to not use too much of the same colour or material. E.g. Include light oak cladding on top of the limestone and a darker shade slate roof. I will check to see that the limestone bricks don't dominate the design colour wise by adding an even mix of materials.
- No visual pollution should be created when building this house, need to keep to natural colours and materials to fit in properly with the landscape / houses surrounding and to not create an eye sore. Visual checks will be carried out to assess the colour and materials.
- The windows should be oak framed, my clients don't want to see white plastic around the house. The oak will then match the doors and exterior cladding (more aesthetically pleasing). I will check what materials the frames are made from.

User Requirements:

- There should be 5 bedrooms and 5 bathrooms to cater for the family. Four of which should be Bedrooms with en-suites and the 5th should be separate guest bedroom and bathroom. To provide luxury as well as to consider guests that would be visiting frequently. Visual checks will be carried out to count up the bedrooms and bathrooms.
- The house should have an integrated annex area with all the correct facilities for an elderly relative, Bedroom, Bathroom, Storage, Small Kitchen. Ill make sure to give space for this when designing.
- For luxury and comfort, underfloor heating (dry system) should be installed in most rooms, since all rooms will have hard flooring and will become really cold in the winter. I will check for the underfloor heating wire coils before the floorboards are built.
- Large bifolding doors should be installed as the back door to open up and compliment the back porch to allow easy access to it and the garden. I will check that a bifold door is located at the rear and connects the porch to the kitchen.
- There needs to be a double garage located at the front of the house and a suitable driveway area in front of the house, to allow accessibility for two cars as well as the storage of them.

Performance Requirements / Safety:

- The clients should be happy with the design and be willing to live in the house. They should also see it as an improvement to their property in Irthlingborough, since this is the main purpose of the whole project. I will make sure of this by getting client feedback once the design is finished.
- The foundations of the house need to be constructed properly and be very sturdy in order to properly support the house and ensure it stays stable for many many years to come. So since the house will be located on a previously built up site, the old foundations will need to be removed and a minimum depth of 1.5m downwards for the steel and concrete will need to be built.
- Considerations for the elderly should also be considered, so the front door shouldn't be accessed by a lot of steps, to guarantee easy access for everyone.
- As a standard for house construction, this house should also take into consideration the anthropometric measurements of the human body to comfortably house the family (correct size doors and correct height ceilings, although higher ceilings are preferred).

Material & Component Requirements / Sustainability:

- Most (or if possible, all) materials should be environmentally sustainable to build with, The oak used for the cladding and the doors / garage doors needs to be sourced from a Forestry Standard Commission approved (or a similar equivalent) site, I will need to be told that the trees will be re-planted after used.
- Materials should all be very durable to prevent the need for replacements or revamps in the future. The house should last the family for generations.
- As part of the thermoslate roof system, the inactive tiles (regular slate) need to be either from a recycled source. (Since slate is not a renewable resource). I will need to check this material source.
- A rainwater collection system should be added to utilize the high levels of rainfall to wash cars, bikes or supply to water based appliances. I will make sure the gutter is connected to the collection tank properly and output to the house.
- The correct level of cavity wall insulation should be installed as well as loft insulation to allow the house to retain as much heat as possible and reduce heating and electricity bills.
- The house foundations should be made out of steel and concrete, the use of recycled steel will also reduce the amount of concrete used (which isn't a renewable material) so will be more sustainable as well as provide extra support.

Scale of Manufacture & Cost:

- This project is a one off, and there will only be one of these houses made. This is very specifically aimed at my clients based off of their specific requests, needs, wants and values.
- The construction of the hose and the purchase of materials should all price up to be within the client's budget of a maximum of £2,250,000 (although this is a safe estimate I have been instructed to stay somewhat below this number). I will make sure of this by saving money where possible and looking for cheaper equivalents for materials or looking for the lowest prices.

3D Design Ideas

Limestone

Brick

Designs with varying roof structures, more interesting

First try at an old-meets new style

Is there too much going on? "Needs SIMPLICITY too"

More traditional design to experiment

Initial concepts of a more Contemporary design

A little too futuristic/modular look for my clients

Birds eye view of the decking with table and chairs

Early concepts of Choosing Materials

Main Roof

Side Roof

PILLAR

PILLAR

PILLAR

Really large property, experimenting with size and modular design

large rectangular windows

Idea for the facure of the pitched roof

Larger Floor Plans

Sketching Floor plans before building upwards

or

Stainless steel beams

Decking Could Possibly be on an upper floor with balcony?

Shingles

Thermalake

the Bifolding doors that my clients requested to have opening out onto the decking

Is this too traditional?

"Needs to be more Contemporary"

Rendered Wall

3D Design Ideas: Design 1

Thermoslate Roofing:

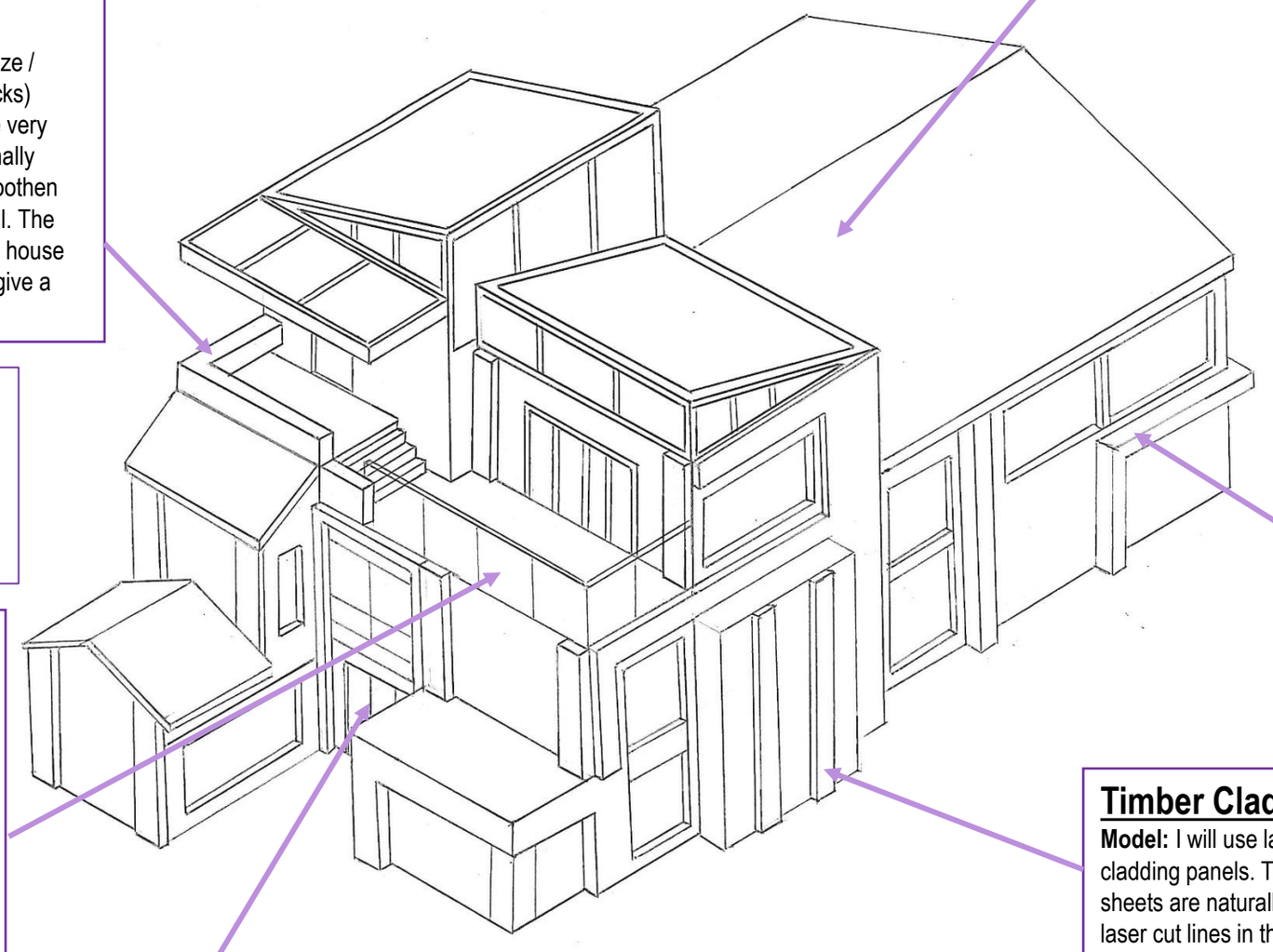
Model: For the model I will make the roof out of MDF as the hard under layer to keep the model sturdy. The top layer will be made from small squares of dark grey fine glass paper, stuck together on the surface of the MDF using the all purpose strong UHU adhesive. To give the slate tile effect I will overlap the squares of glass paper and stick them on top of each other. I will use MDF because it's easy to cut and shape due to the lack of grain, the surface is also very smooth to stick over. Glass paper because it's easy to cut and shape but gives the professional aesthetic of the slate.

Manufacture: This large pitched roof will be made primarily from Thermoslate, mainly because they are an efficient and stylish equivalent to solar panels. (Will increase the house's sustainability and reduce electricity costs). Also since my clients wanted a dark slate roof, but also wanted the house to have sustainable elements. Having this pitched roof is essential because my clients wanted an old-meets-new style house, this is the more traditional element to the design. The Thermoslate tiles will be nailed to underlying timber battens, these will be made from pine since it is a cost efficient and weather resistant timber. A waterproofing rubber membrane will be laid down to prevent rainwater from entering the house. The non active regular slate tiles will be nailed down in layers over each other to prevent rainwater from running in between the tiles.

Rendered Wall:

Model: I will cut out blocks of MDF (because of the lack of grain, means that it is easy to cut and shape as well as smoothly paint over) in the shape of the wall and I will paint over the surface in a light grey emulsion to replicate the look of the painted render. The under-layer will be glued to the edge of the balcony in an all-purpose adhesive. (e.g. UHU).

Manufacture: The wall will mostly be made from breeze / cinder blocks (these are aerated concrete blocks / bricks) since they are very inexpensive and durable and have very good structural stability. The blocks will then be externally rendered (using a mixture of sand and cement) to smoothen out the blocks and hide the eye sore of a concrete wall. The render will be painted a similar colour to the limestone house walls using an exterior and weather resistant paint to give a nicer aesthetic appearance to the wall.



Steel Beams:

Model: To replicate the look of a steel beam, will be using dark grey acrylic. I will laser cut the acrylic into long thin strips, glue them together in a rectangular tube shape using an all purpose adhesive. They will run from the roof down to the base of the model, as well as horizontally along the surface.

Manufacture: The beams will be made from stainless steel in a rectangular tubing shape, this is for aesthetic purposes as requested by my clients. They will be installed along the wall surface of the house rear. They will be bolted to the timber battens similar to the oak cladding using nuts and bolts. Stainless steel used because of it's strength and resistance to corrosion (little maintenance required in the years to come after construction), also the aesthetic is to my clients liking.

Client Comment:

We really like the overall structure of this design, especially the new meets old style with the large pitch at the back mixed with the contemporary tall front. However the house looks a little too complex and clustered, we would like to see the design simplified.

Glass Panels:

Model: I will use clear acrylic plastic for the panels, since they are clear, tough and best represent the look of glass. They will be laser cut to the correct dimensions for accuracy to give a cleaner fit together. Acrylic cement will be used to stick the panels into place along the base. A small strip of pine will be placed along the tops for the handrail.

Manufacture: These large glass panels will be installed on the second story balcony overlooking the front of the property. The glass will be tempered to make it stronger and less likely to shatter into large, sharp pieces, reducing risk of injury for my clients. Since the panels will be so large here, regular glass panels will not be strong enough if hit hard by mistake. The glass sheets will be cut to the right dimensions and connected together by a clear silicone sealant along the base. A thin oak handrail will be attached to the top of the panels. Glass manufactured using sand / silica, sodium oxide and limestone, mixed and put into a furnace at 1500°C, then cooled and cut.

Front Door:

Model: On the model, the door won't be fully functional, instead I will have an indent in the surface of the wall. To represent the look of light oak, I will use a thin sheet of plywood to give the grain effect. I will use the laser cutter to etch the look of planks into the surface. Finally I will stain the surface of the plywood a shade darker using either varnish or tea bag staining.

Manufacture: The door will be primarily made out of oak, I will try to use recycled / reclaimed oak to keep the house environmentally sustainable and not drain too many resources. If done correctly the oak will give age to the property. The door will be a double door with heave duty stainless steel hinges (to handle the weight of the oak). Stainless steel door handles to match the hinges and steel beams as well as still being resistant to corrosion and weathering to keep shiny and sleek, as to what my clients want.

Timber Cladding Panels:

Model: I will use laser MDF to replicate the look of the timber cladding panels. This is very beneficial because the laser MDF sheets are naturally thin yet tough and easy to work with. I can also laser cut lines in the sheet to represent the panels interlocking together on the wall surface. Also this means minimal waste of materials. This way I can easily make a complex design accurately. I will stick the sheet on with an all purpose adhesive (e.g. UHU).

Manufacture: These cladding panels will be made out of a light oak due to the request of my clients. The oak will be recycled / reclaimed for sustainability purposes. They will be implemented all around the house to give complexity and variation to the wall surface. The oak panels will be nailed (using stainless steel rink shank nails to stop corrosion) to extruding timber support battens in order to be flush with the surrounding Limestone bricks. A 20mm moisture gap must be left to insure air circulation behind the boards.

3D Design Ideas: Design 2

Foundations:

Model: A moderately thick sheet of MDF, around 50mm thick, and to a larger size than the base of the house. The house will be stuck to the base with an all-purpose adhesive in order to keep sturdy and in place.

Manufacture: The foundations will have a total depth of around 1 metre (below ground level) by 600mm wide (footings). The base will be filled with concrete to provide a sturdy underlayer to build up on, concrete is fairly inexpensive, very strong when squashed (made from cement, water, sand / gravel). The foundations will be reinforced with recycled stainless steel beams (dig down and fit vertically) to reduce the amount of concrete used as well as provide a much stronger supporting layer. Since concrete isn't as strong when stretched, the steel will provide support (steel strong when stretched AND squashed).

Glass Peak:

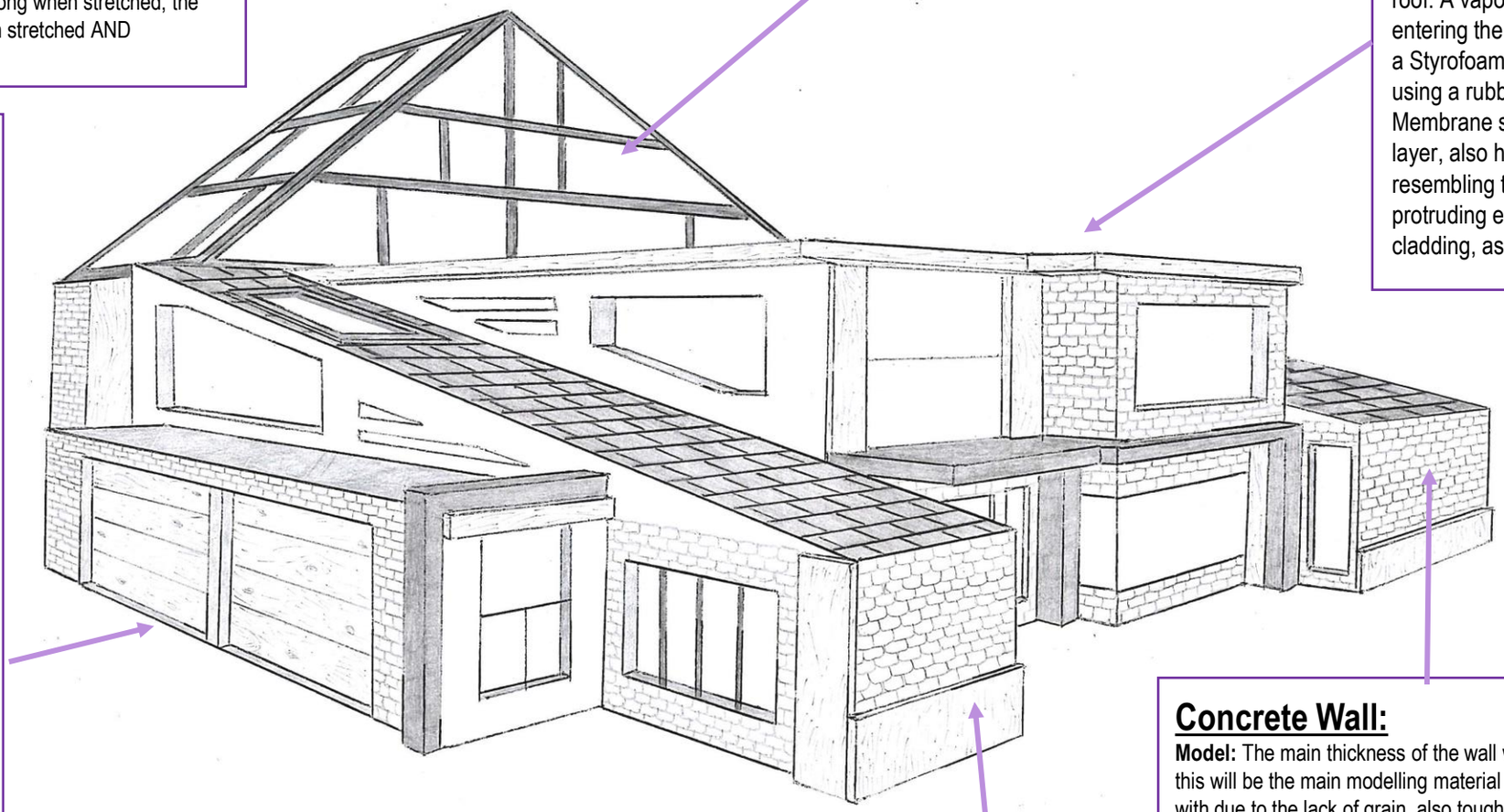
Model: The peak will be made from clear acrylic sheets (similar to all the other widows / glass elements to this design) as it's the best material to replicate the look of glass, is very stiff, also it is widely available and non toxic. The steel frame will be made by more laser cut acrylic (dark grey / black) stuck to the surface of the clear acrylic (if the sheets can be bought thin enough). This way the design can have depth since the frame will protrude out slightly from the panes.

Manufacture: The large glass panes will be made from tempered glass, because it is the strongest (4x stronger) and safest type of glass that can be used domestically, the glass doesn't shatter into large shards for safety. However you can't recycle tempered glass unfortunately, since it has a different melting point and include different chemicals. Ordinary glass sheets are heated to 600°C in a tempering oven, then dipped into water (quenched). The peak's frame will be made from stainless steel, will resist corrosion over time, will be long lasting and structurally stable.

Flat Roof:

Model: I will lay down a thin sheet of MDF for the flat section of the roof (no grain means easy to cut to the correct dimensions, also accepts adhesives well), allow MDF to overhang by 1-2cm. Using all purpose adhesive, stick down a layer of dark grey fine glass paper of the same dimensions for the rubber membrane surface. The glass paper gives a nice texture representative of the real material.

Manufacture: A ply timber decking will be laid down and nailed to supporting battens. Pine used because it is inexpensive / cost efficient timber, also has very good structural stability for supporting the roof. A vapour control layer (stop moist vapour from entering the house) on top of the decking as well as a Styrofoam insulation layer underneath. Finally, using a rubber-bond adhesive, the EDPM Rubber Membrane surface is the outer 100% waterproof layer, also has a dark grey surface somewhat resembling the colour of the slate tiles. The protruding edge will be light oak to match the cladding, as per the request of my clients.



Garage Door:

Model: Here the modelling is done in a similar way to the front door, indent / cut out two rectangles in the side of the wall. Cut out two rectangles of pine (inexpensive and easy to cut / shape / stain) of the same dimensions, stain them a darker shade of brown using varnish / tea bags. Etch out details / design with the laser cutter to show the planks. Then glue into place using an all purpose adhesive (very strong and reliable hold, also is clear so doesn't effect the material colour, and very versatile). Laser cutter provides extreme accuracy and can engrave any shape using a laptop.

Manufacture: To give a greater material and colour variation to the house, the garage doors will be made from Cedar rather than Oak, Cedar used because of its darker shade and high aesthetic appeal, extremely durable and is weather resistant / outlasts other timbers outdoors. The door will be divided into 2 sections (double garage) and each will be opened by an Up-and-over system where the door opens up vertically and rolls back along the interior ceiling, since it's a easy and no-hassle operation.

Client Comment:

We really like the design of the garage door panelling, I think it goes really nicely with the other cladding. I also like the use of environmentally sustainable materials here. However do not like the varying styles of window frames, we wish to have the windows as one big pane of glass rather than all the separations.

Cladding Panels:

Model: Since the cladding panels need to be very thin and of even thickness, I will use laser MDF sheets, pre-cut thickness sheets will improve the quality and accuracy of the making. The MDF is very inexpensive and easily stained to look like real wood, also very accepting of adhesives. The board will be stained slightly lighter to look like light oak. Will be attached by UHU adhesive (all purpose) so the panels are guaranteed to stay stuck.

Manufacture: Cladding panels made from a light oak since this was one of the main material wants of my clients. Timber will be used for the cladding because wood is an environmentally friendly material, renewable and can re-plant trees. Also has great insulation and noise cancellation properties. The panels will be nailed to underlying timber battens (using stainless steel rink shank nails to stop corrosion and provide a good, long lasting hold).

Concrete Wall:

Model: The main thickness of the wall will be a moderately thick sheet of MDF. As this will be the main modelling material I will be using. (Again being very easy to work with due to the lack of grain, also tough enough to support the structure). The sheet will be too thick to laser cut, so I will use either a Tennon saw or the band saw to cut out the main structure. MDF can the be laser cut and textured accordingly to improve the aesthetic and represent the limestone bricks on the surface.

Manufacture: The main material for the centre of a house's walls are breeze blocks / cinder blocks. I will use them in this design because they are inexpensive, large, structurally stable and provide insulation properties so less heat loss from the house in winter, the best material. The blocks are widely available and will come pre-cut to the correct thickness. The outside visible layer will then be the limestone bricks as requested by my clients. The blocks being made from concrete (mixture of water, cement and rock/sand/gravel. Laid down in an overlapping brick formation and connected using cement mortar

3D Design Ideas: Design 3

Curved Roof:

Model: First I will stick around 20 to 30 split dowels together to create a corrugated mould, (using the rounded sides). I will get a dark grey sheet of HIPS (High Impact Polystyrene) and heat / mould it over the dowel mould using the vacuum former. The heating of the plastic allows the HIPS to take the shape of the corrugated mould. Once cooled and set, the HIPS is bent into the curve of the roof and stuck over the MDF walls with an all-purpose adhesive.

Manufacture: For the three roof sections at the front of the house, corrugated sheets of galvanised steel will be used. Because sheet steel can be bent to fit the shape of the roof, unlike shingles where it can be difficult to lay on a curve. Also the galvanisation means the steel is corrosion resistant. The sheet metal dipped into Zinc, the protection lasts for 20+ years. The metal sheet will be nailed to horizontal pine battens using nuts and bolts, (because they are easy to replace, give strong connections and are corrosion resistant themselves).

Client Comment

We really like the sloping roofs on this design, really unique and contemporary, makes the house look less blocky. We like the large top window, since it will let in a lot of natural sunlight and reduce lighting bills. However, we do not the large corner windows running up the wall, instead we prefer it to be stainless steel panels.

Rendered Wall:

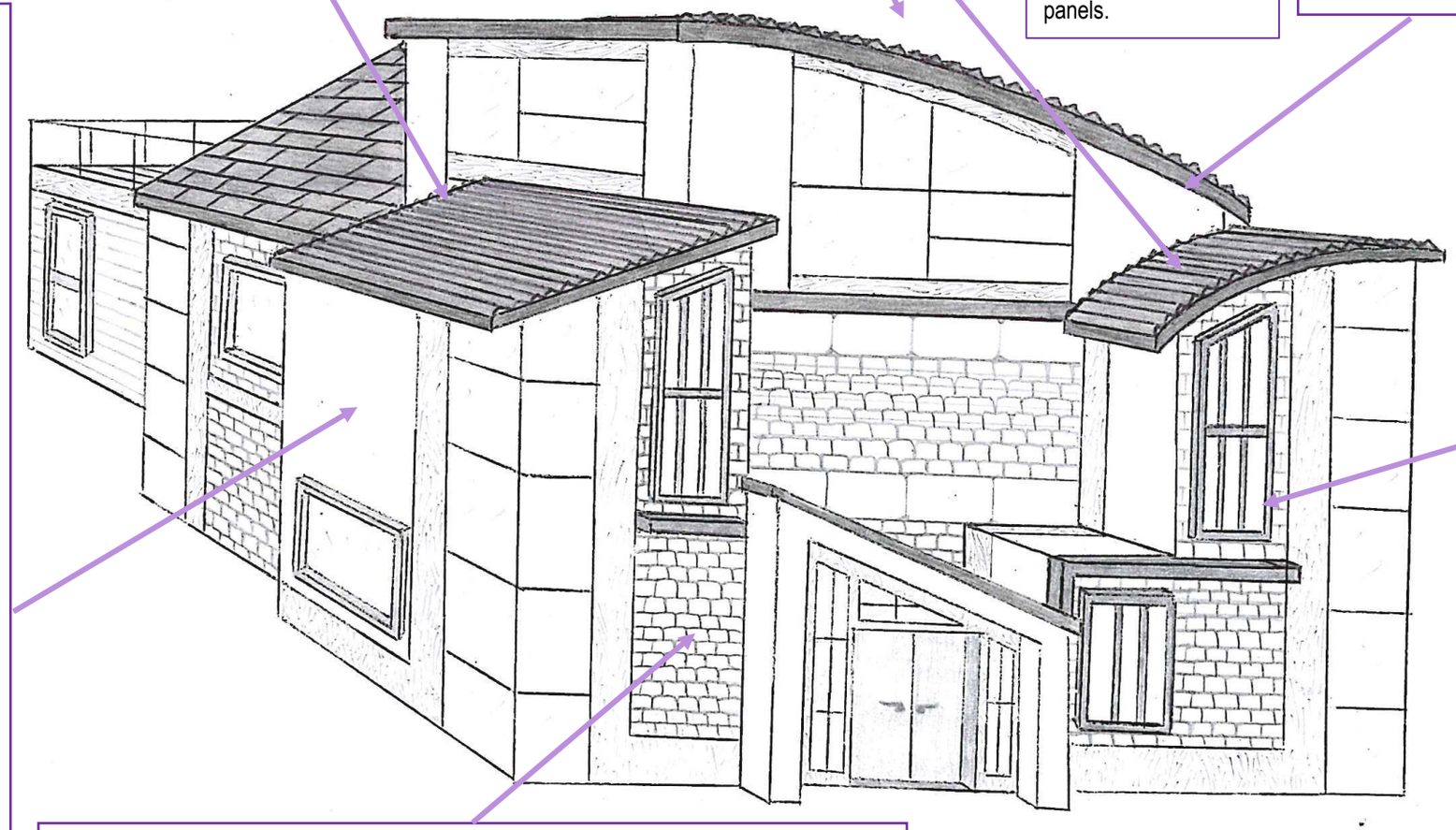
Model: The main wall will be the MDF just like the rest of the walls, will paint over the surface in a light grey emulsion to replicate the look of the painted render. I will make sure to give an even thin coat (using a thin brush) to keep the smoothness of the MDF.

Manufacture: The wall will mostly be made from breeze / cinder blocks (concrete blocks / bricks) since they are very inexpensive, durable, have very good structural stability as well as trap air for insulation. The blocks will then be plastered over with the render (a mixture of cement and sand, to smoothen out the blocks and hide the concrete wall. The render will be painted a similar colour to the limestone house walls using an exterior and weather resistant paint to give a nicer aesthetic appearance to the wall.

Limestone Bricks:

Model: Large sheets of laser MDF will be cut to the correct dimensions using a laser cutter. The be painted with a thin coat of light grey emulsion (used because it's less toxic compared to oil paints, are easy to apply and quick drying). Painted sheet will go into the laser cutter, a pre-made brick pattern will be laser etched onto the surface to represent the bricks (laser cutter used because it can cut out patterns very quickly and accurately with no error). All purpose adhesive used (because of its fast drying and strong hold) to stick the sheet onto the underlying MDF house walls.

Manufacture: The bricks will be laid down in the same way as the concrete blocks making up the majority of the wall's thickness. Laid down in an overlapping brick formation using cement mortar in between each brick. The limestone was chosen because of my clients liking that stone, this was their main "want". Also is a very aesthetically pleasing material, being one of the main traditional elements of the house. High strength / durability and corrosion resistance. Will be mined mainly in the UK and cut into block / bricks (I will be using reclaimed / recycled limestone to reduce the cost of the project as well as increase environmental sustainability.



Window Frames:

Model: The frames will be made out of laser MDF, cut to the correct dimensions of the window hole in the side of the wall. Then stuck down using an all purpose adhesive. The two divider in the middle will also be thin laser MDF, once stick in, a sheet of clear acrylic will be stuck over for the window panes.

Manufacture: These window frames will be made from a light oak to match the cladding. Rather than being a light oak they will be a slightly darker shade, possibly English Oak to give grater colour variation to the front of the house. Oak because of its durability and resistance to rotting as well as being one of my clients main "wants". The window dividers in between the double glazing will also be made of thin planks of oak. If possible, the oak trees cut down should be replanted to increase sustainability. The glass used will be double glazed tempered glass. The double glazing creates a trap of air which improves insulation, the tempering of the glass improves safety (will shatter into smaller harmless shards) and strength.

Insulation:

Model: Since all the insulation layers will be in between the walls there is no real need to display this in the model since it will not be seen in reality either. So I will just layer the limestone brick textured laser MDF on top of the thicker MDF house frame (using an all-purpose adhesive).

Manufacture: In between the concrete blocks and the limestone brick outer layer. There will be a Styrofoam and fibreglass cavity wall insulation layer. (Styrofoam and fibreglass because they both trap air which stops heat from escaping through the walls, lightweight, is very resistant towards moisture and water vapours) So less heat loss and less energy needed to keep room temperature. Also will have a permeable vapour control layer to stop the passage of moisture through the wall and causing damage.

Rooftop Decking:

Model: A thin sheet of Laser MDF will be laid over the top of the MDF flat roof. This sheet will be laser cut then laser etched to show the plank lines on the surface. Laser cutter used because of its accuracy and consistency with small details, can replicate the same design every time. The MDF will be stained a lighter reddish colour to best represent the cedar. Then finally glued using an all-purpose adhesive.

Manufacture: The floor boards for the decking will be made out of Red Cedar, as I think this is one of the most aesthetically pleasing woods, it is water and decay resistant also. I will install a watertight EPMD rubber membrane over the top of the roof and underneath the Cedar planks, the rubber membrane stops any rainwater from falling between the planks and contaminating the roof / ceiling underneath. The Cedar planks will be nailed to timber battens facing perpendicular to the cedar for strength.

3D Design Ideas: Design 4

Pitched Roof:

Model: The hard under layer will be a sheet of MDF for all the same reasons. The model will stay sturdy, its an inexpensive material and the surface is smooth to stick over due to lack of grain. The slate tiles will be represented by small squares of overlapping dark grey, fine glass paper. Stuck down in that formation by an all purpose adhesive (UHU glue). The glass paper is easy to cut and stick down, is very accessible.

Manufacture: The shingles will be make from slate and thermoslate. Thermoslate has the properties of solar panels, only the tiles themselves are solar collecting and there is no need for unsightly large panels on the roof. Will increase house sustainability and reduce energy costs whilst still looking stylish and having the sate roof that my clients wanted. Since the thermoslate comes in 1m x 1m, any excess area on the roof will be laid with regular slate tiles. They will all be nailed to underlying pine battens (cost efficient, resistance to decay and long lasting).

Flat Roof:

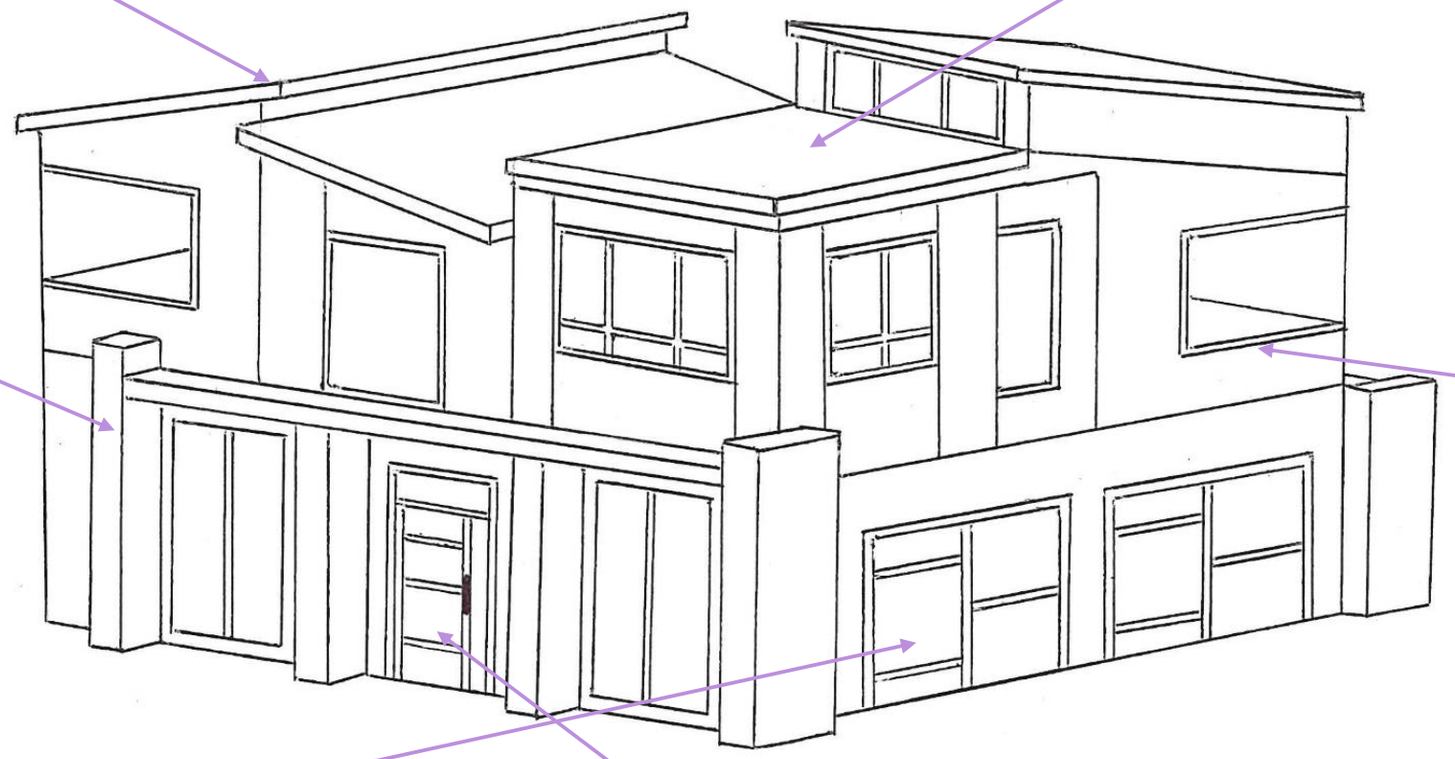
Model: The main structure of the roof will be made from a single sheet of MDF, simply because it is the most widely available composite where I'll be making the model. Also the lack of grain means easy to cut and shape, as well as it being accepting of adhesives. The rubber membrane will be a flat sheet of dark grey glass paper, a very cost efficient and simple way to represent the roofing material. This will also be stuck on with an all purpose adhesive similar to the MDF roof.

Manufacture: The top / surface layer of the roof will be made from an EDPM Rubber membrane sheet. These lay down like huge stickers and are great for avoiding possible leaks at the seams. Rubber used because it is long lasting, extremely waterproof and has good chemical resistance. Underneath, a ply timber decking will be laid down and nailed to supporting battens. Pine because it is inexpensive, resistant against decay and rotting, widely available and has very good structural stability for supporting the roof. A vapour control layer (to stop moist vapour from entering the house) on top of the decking as well as a Styrofoam insulation layer underneath to trap air, because roof insulation is the most important insulation (heat will rise up and out of the roof if not).

Rendered Pillars:

Model: Each pillar will be made from blocks of MDF, similar to the rest of the house. I will use a light grey emulsion to paint over each block. Choose emulsion because it is less toxic than oil based paints, they are fast drying and come in any colour required. Finally will stick the non-emulsion side to the house wall surface with UHU adhesive.

Manufacture: Each will be made from concrete / cinder blocks since they are easily affordable and have very good structural stability. The blocks will then be externally rendered (using a mixture of sand and cement) to smoothen out the blocks. The render will be painted a similar colour to the limestone house walls using an exterior and weather resistant paint to give a nicer aesthetic appearance to the wall.



Window Frames:

Model: The frames will be made from a dark grey acrylic, because it is very hard, abrasion resistant and widely available in the range of colours I need. Thin sheets will be laser cut (because of the machines swiftness and accuracy down to the nearest millimetre, also the cut will look a lot straighter and cleaner than cutting manually.) to the correct shape and stuck down on the wall surface with an all purpose adhesive. It has excellent hold strength, fast drying and widely available.

Manufacture: Here I will be using fibreglass window frames, because they're dimensionally stable, long lasting, durable, UV and corrosion resistant, and have air cavities that can be filled with insulation giving them better thermal insulation properties than wood or vinyl / PVC. Meaning less heat loss from the house and reduced heating bills overall. Also there is an option for a dark grey colour which will match the roof (improves aesthetic value, also because my clients do not want white PVC frames). Will be installed correctly so no worries about toxic fibreglass dust in the air causing irritation. The fibreglass is made from a woven material embedded with randomly laid glass fibres and held together with a binding substance. Flattened into a sheet.

Garage Doors:

Model: Indent / cut out two rectangles in the side of the wall. Cut out two rectangles of pine (inexpensive and easy to cut / shape / stain) of the same dimensions, stain them a darker shade of brown using varnish / tea bags. Etch out details / design with the laser cutter to show the planks. Then glue into place using an all purpose adhesive (very strong and reliable hold, also is clear so doesn't effect the material colour, and very versatile). Laser cutter provides extreme accuracy and can engrave any shape.

Manufacture: These are made from connected planks of Cedar, this gives a timber variation from the wood cladding and go well together.. Cedar is a very good thermal insulator, is weather and decay resistant, so will be very long lasting and stylish. Each will be opened by an Up-and-over system where the door opens up vertically and rolls back along the interior ceiling, since it's a easy operation.

Front Door:

Model: The door will not be fully functional for the model, A thin sheet of plywood will be used to represent the oak, stained a darker colour using varnish or tea bags. Details will be laser etched on using the laser cutter and finally stuck on using an all purpose adhesive.

Manufacture: Will be made from Oak and tempered glass. The bottom section of the door being the oak (I will try to find reclaimed or recycled oak planks to be more environmentally friendly and sustainable), the oak is durable to rotting but mainly used because of my clients preferences, and the top and sides being tempered glass panes. Tempered glass is essential since the door needs to be as strong as possible and not shatter if hit, the tempering process (heating up in a furnace and quenching gives extra strength to the glass and stops it shattering into large shards. All held in place by heavy duty stainless steel hinges, this will be able to hold the weight of the door, be very long lasting and be resistant to corrosion over time.

Client Comment:

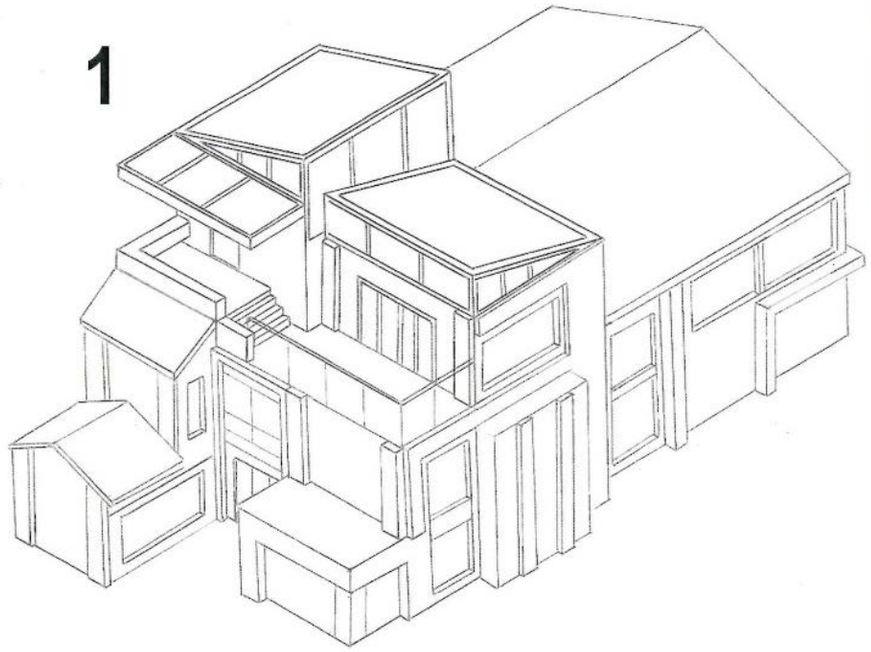
This is our least favourite design, as we do not like the overall shape, we think it looks too much like an industrial building rather than a house, it needs more angles. But, we do like the matching garage and front door designs. However, not the rendered pillars at the front.

Client Feedback

Design 1:

We can see that the Contemporary vs traditional look is really noticeable here. We like the mixture of old barn conversion and modern glass, with the glass enforcing the open and airy atmosphere.
There looks to be a lot of storage space in the back pitch which is perfect for us.
The large balcony will suit us well as we love to sit outside during summertime.
My only criticism is that the modular part of the build is a little too busy. Maybe simplify it slightly?

1



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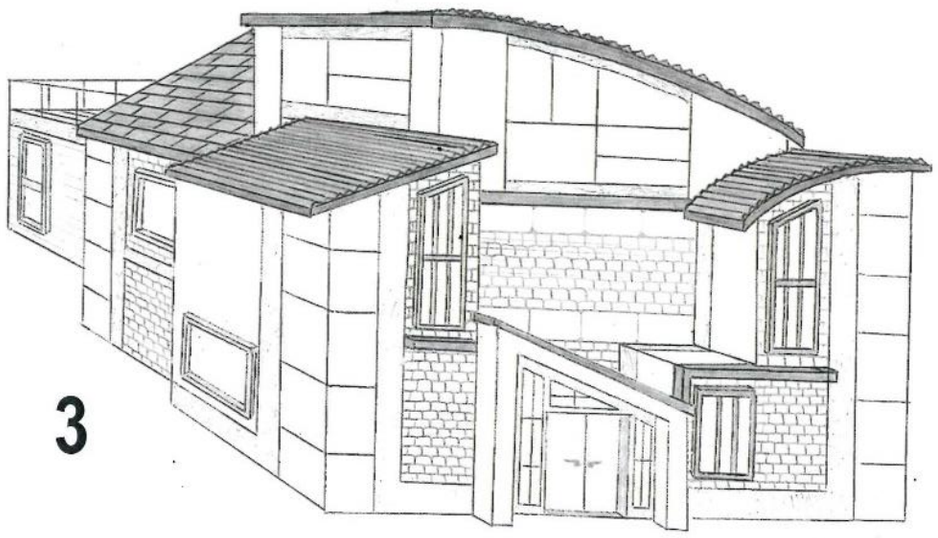
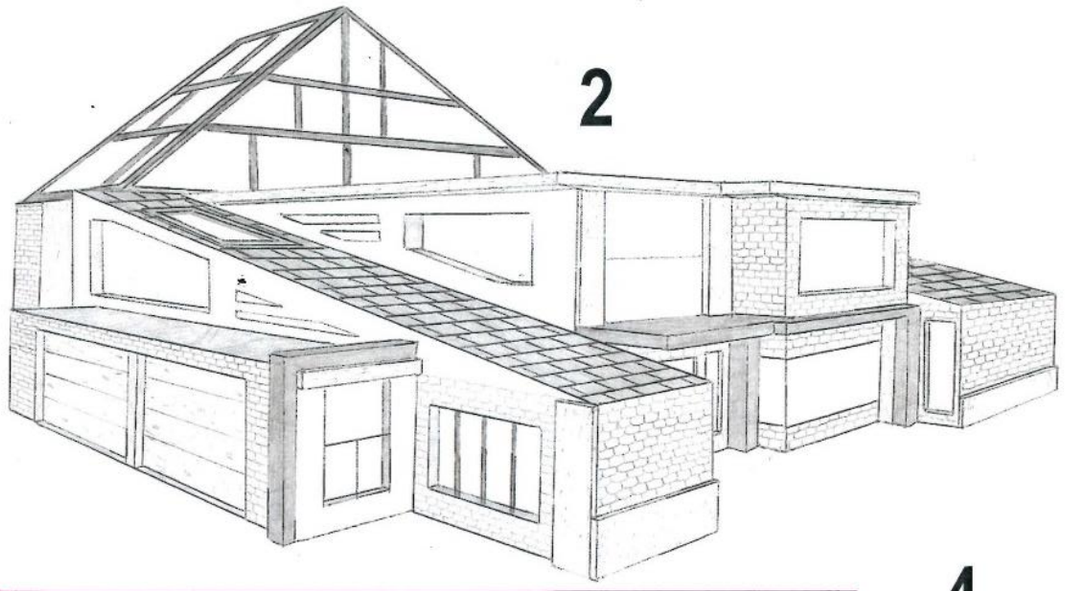


Design 2:

By far the most unique design of all.
We like the unusual approach with all the different shapes and angles.
It is more interesting than a traditional brick build. We like the combination of several materials such as brick, wood, steel & render. It keeps the design looking interesting at all times.
The only thing I would change would be the windows, by opening up removing panes to create one huge piece of glass - less obstruction or separations

Design 3: This is our favourite design. We like the sloping roof idea. It makes the property unique which we would like to have in our choice of design. I would however like to remove the corrugated finish and replace with a smooth finish.
The design is simple yet satisfying since it isn't too complex or busy like design one. There is still a roof top decking/seating area for our outdoor summers, which is essential.
We would like to see some steel incorporated in this design as this was a feature we particularly liked from design two. It would also then balance out the use of wood cladding.

2

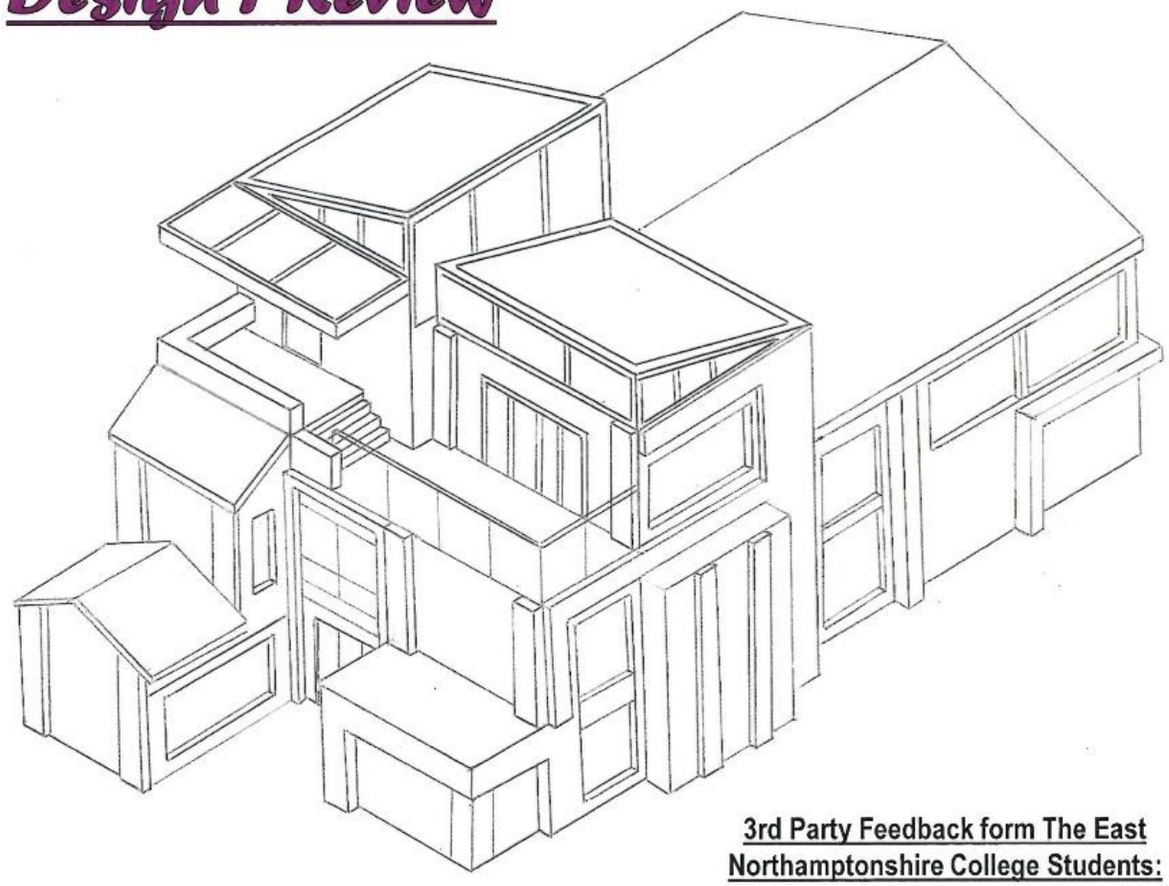


Design 4:

Maybe our least favourite design of all, but there are some elements that we like a lot.
The roofing design is unique, with a flat section and three pitched sections all facing different ways. This adds variation to the shape of the building, however, we feel that overall the main structure is too square and not what we wanted.
We like the design of the front door and garage doors very much and how this incorporates another type of wood for material variation. We would like to include these on our final design/structure.

4

Design 1 Review



3rd Party Feedback form The East Northamptonshire College Students:

Joe: "The front of the house is an intricate design, but poorly contrasts with the generic design of the rear. I appreciate the new-meets-old look but it isn't to my preference. The balcony is a nice addition however, helping the modular and contemporary look. The glass panel barriers help this."

Amy: "The creative use of tiered floor is interesting and sets the house apart from contempt modern designs. I also like that the house incorporates natural timbers; helping to improve the sustainability of the house. I also like the way that the pitched roof at the back contrasts with the modular sections at the front."

Brandon: "I find the change from the detailed front of the house to the minimalistic back of the house, too stark. This is my favourite design out of the 4 due to the differing shapes and innovative use of balconies." I am a fan of the amount of glass used on the 2nd story as it will let in plenty of light."

Client Feedback:

What do you like about this design / what wouldn't you change?	"We really like the idea of the balcony at the front, especially with the use of glass making it look very contemporary just how we wanted. The large Thermoslate roof at the rear looks very modern and contrasts well with the modular look at the front."
What do you not like about this design / what would you improve?	"We would prefer the timber cladding to be flush with the surface of the wall and some timber to be replaced with stainless steel to balance out the materials more. Also to remove the flat glass roof over the balcony as we wish the area to be less enclosed."
How do you feel about the general shape of the property?	"The shape is good, very complex. The old meets new style is very noticeable and executed well. We enjoy the large size for practical and comfort reasons. We like the idea of having a 3rd floor as well as a balcony too."
Does this meet your needs and wants / would you live in this house?	"This has satisfied our needs of a large house able to fit 5 bedrooms / bathrooms for our growing family. Also our wants of the very contemporary looking design with some traditional elements. We would be very happy to live here."

Function:

This design has met the function requirements of this specification well because:

- This design is the largest one out of the four, and will guarantee space for 5 bedrooms, 5 bathrooms, a large kitchen and living room, an annex etc. My clients will have a large amount of space to live and store belongings, living a comfortable life.
- The plot my clients chose is in a rural village of Hale, Manchester. Since they chose the plot themselves, I know that they are happy with this location, specification met.
- There will be a few environmentally friendly aspects to this house; the large pitched roof at the back of the house allows a large area of thermoslate tiles to be laid down so a lot of solar energy can be utilized around the house. The slope of the roof allows a large surface area for rainwater to be caught and run into the rainwater collection system and save on water bills.
- This house is more long than it is wide, which is really good for the plot which is the same shape. Space can be maximized and the house will fit well. There are no overhanging parts to this house so it will not overhang into other plots either side of this house. Planning regulation requirements met here.
- This property will have a large pitched roof at the rear of the house, to give the old-meets-new feel and to give a large storage space for my clients, since this is one of their main needs form this project. A double garage can be seen at the side of the house, plenty of space set aside for two cars.

Form:

Design 1 has met the requirements for design / form well because:

- This design is quite unique compared to my client's current house design in Irthlingborough, There are a lot more different shapes towards the front of the house (being complex, modular and contemporary), however more basic towards the rear with a traditional pitch. My clients are happy with this look so the specification is met here.
- All of the windows are large and rectangular with varying sizes, enough to let a lot of light into the house and give the light and airy atmosphere that my clients want to create. All windows are fibreglass framed, dark grey to match the thermoslate roofing. Client wants met here.
- The materials on the external walls give a vary of colours, textures and patterns. Just as my clients wanted. There is a light brick texture with light oak, as well as dark grey rubber membranes, thermoslate and stainless steel. An even mix. With this said, there will no visual pollution created since the house will look out of place or too large compared to the surrounding properties.

User Requirements:

The user requirements have been taken into account with this design because:

- This house is certainly large enough for 5 bedrooms, with 4 of which having an en-suite bathroom. To accommodate my client's family as well as any visiting relatives.
- There is space for the annex area on the ground floor, there are still plans for it even though it is not visible in the drawing. Perfect for my client's elderly relative who will have their own small bedroom, bathroom etc.
- Underfloor heating will be added to most rooms, a dry system (heated wire coils under the floorboards). To keep warm in the winter.
- In this design, the back porch has been replaced for a balcony at the front of the house, being able to fit a large table and chairs, the bifolding doors are visible here and will open up on to the decking.

Performance Requirements / Safety:

Overall my clients are really happy with this design because:

- My clients have said that they are very happy to live in this house, but if it was reduced in size slightly, since the size is a little too over-the-top for them. They see it as a definite improvement to their current property.
- Building regulations will be kept too during construction of this design, the foundations will be dug below 1.5m deep (and utilise steel as well as concrete) to provide good support. The door and ceiling heights will all be the correct heights. It will be built properly.
- No ramps needed for the elderly since the entrance is not elevated and the living area (annex) is located on the ground floor.

Material Requirements / Sustainability:

This house is using the correct materials and is environmentally sustainable because:

- Most materials used here have been either reclaimed form a recycled source or are able to be recycled after use, making this house an environmentally friendly project, having minimal environmental effects. All timber (all doors, internal framework, cladding and garage) has been sourced from an FSC approved forest meaning replantation. Slate tiles and limestone bricks have also been reclaimed to reduce need for mining new rock.
- Materials will be chosen based off of price and durability to stay in budget but make the house last as long as possible, to see my clients through retirement, and have no need to replace materials along the way.
- As a standard for housing, cavity wall insulation will be installed as well as roofing insulation to trap heat and keep internal warmth.

Scale of Manufacture / Cost:

This project is using one-off production, this house is designed specifically for my clients (based off of their own needs, wants and values) and nobody else. However the larger scale of this house may mean the project may go a little over budget, and this needs to be changed.

Design 2 Review

3rd Party Feedback from The East Northamptonshire College Students:

Joe: "The glass pyramid is a nice design and modernises the house but seems out of place, as it seems too intrusive. The mixture of brick and render makes the house stand out, as the two contrasting materials keeps it from looking like a standard property. The wood cladding adds a nice traditional feel to the house, but some panels just seem to be placed randomly with no synergy to the rest of the house."
Amy: "This building looks like it will be the most comfortable to live in because of the large plans of the 3 floors.(less stairs and variations in floor height) The brick exterior will help the house fit with the surrounding buildings. Although this wouldn't be the best design for the rectangular plot; the garage is in the right place but the front door should be moved the same face for easy, un-obstructed access."
Brandon: "The glass atrium is an aesthetically pleasing addition to the house , however it may not be very functional. Without proper ventilation this space would act as a greenhouse (unbearable in the summer heat).If this was addressed and floors added to maximise space , the pyramid could be a desirable design aspect."

What do you like about this design / what wouldn't you change?	"The different textures of timber, brick, steel etc. are interesting and give character to the property. This keeps the house way more interesting rather than just red brick. The long sloping roofs are very unique and add more angles which is nice."
What do you not like about this design / what would you improve?	"We have agreed that the separation of glass would be more difficult to maintain, so we would like to remove some of the window separations on the peak as well as round the sides, to have larger sheets of glass. Also removing the window form the garage as privacy of our belongings is important to us."
How do you feel about the general shape of the property?	"This is the most unique shape here, Its great because it will catch people's eye. We like having a house that is different from the conventional brick build so this is very nice. The sloping roofs make the house look less blocky."
Does this meet your needs and wants / would you live in this house?	"This house doesn't meet our needs as well as design 1 since it is nowhere near as large, we might struggle to fit everything we need inside. The thing this house does well is the uniqueness of the structure which we like. If a little larger we would live here."

Function:

Overall I think that I have met the specification for the function of the house because:

- The house is a suitable size for a family of five. There is enough living space for 5 bedrooms and 5 bathrooms to fit in comfortably, including various other essential rooms. (Clients needs met here).
- The house will still be built in a rural area as the plot chosen has not been changed, still in Hale, Manchester. It is still a quiet area with a low population density.
- Although the general shape of the design is not very elongated, it will still fit the plot since it is more long than it is wide. Also there are no large overhanging structures coming off of any sides of the hose, so there is no risk of the house extending out into other plots either side. (Building regulations accounted for here).
- The design doesn't have a traditional pitched roof but it has a large glass and stainless steel peak towards the back of the house. This will provide all the storage space needed for the family. Also sloping roofs towards the front of the house provides good space for the solar power (thermoslate tiles) as well as a pathway for water to run into a rainwater collection system.

Form:

This design has met the specification well when looking at the form and design of the house because:

- This design is a very unique structure / shape, since no conventional houses follow this form, this house will be unique to my clients and this is what they want. No red brick is used in this design, only limestone bricks. (So has partly met the specification here).
- Although not all windows are rectangular, there are many large windows at the front of the house as well as the peak at the rear being mostly glass. (Partly met the specification). So plenty of natural light can enter the house and reduce energy bills, and with no circular windows.
- There isn't a very large range of different materials used here, but there are more different materials, textures and patterns compared to my clients current house in Irthlingborough. (Specification partly met). The light oak cladding, limestone and thermoslate roof are present.
- All materials are very much kept to natural colours so no visual pollution created.
- There are no PVC window frames here, only grey fibreglass as my clients wanted. (Specification met).

User Requirements / Safety:

My clients needs, wants and values have been considered in this design because:

- There is enough space in the house to have 5 separate bedrooms and bathrooms as well as an annex area for an elderly relative, so the specification is met well here.
- Even though it cannot be seen from a front exterior view of the design, there are still plans for the back sheltered porch area, as well as the bifold doors to connect it to the kitchen. The floor will be underfloor heated still. (Specification will be met here).
- The back porch / deck area will still be constructed as well as the bifolding doors to lead out onto it.

Performance Requirements / Sustainability:

The specification has been met fairly well in terms of safety and requirements of the house because:

- I have received client feedback about this design and they are happy with it. They enjoy the unique shape, the material choice as well as the colours generally. They will be happy to live in this property.
- Not visible in the drawing but the foundations will meet building rules and regulations by being dug to the correct depth of below 1.5m. The concrete will fill the hole as well as recycled steel beams for extra support.
- No ramps have been installed to assist the elderly. However they aren't needed since the front door is wide enough anyway being a double door and is not elevated above ground level so easy access for wheelchairs.
- The door and ceiling sizes have been taken into consideration and visualised correctly here.

Materials / Sustainability:

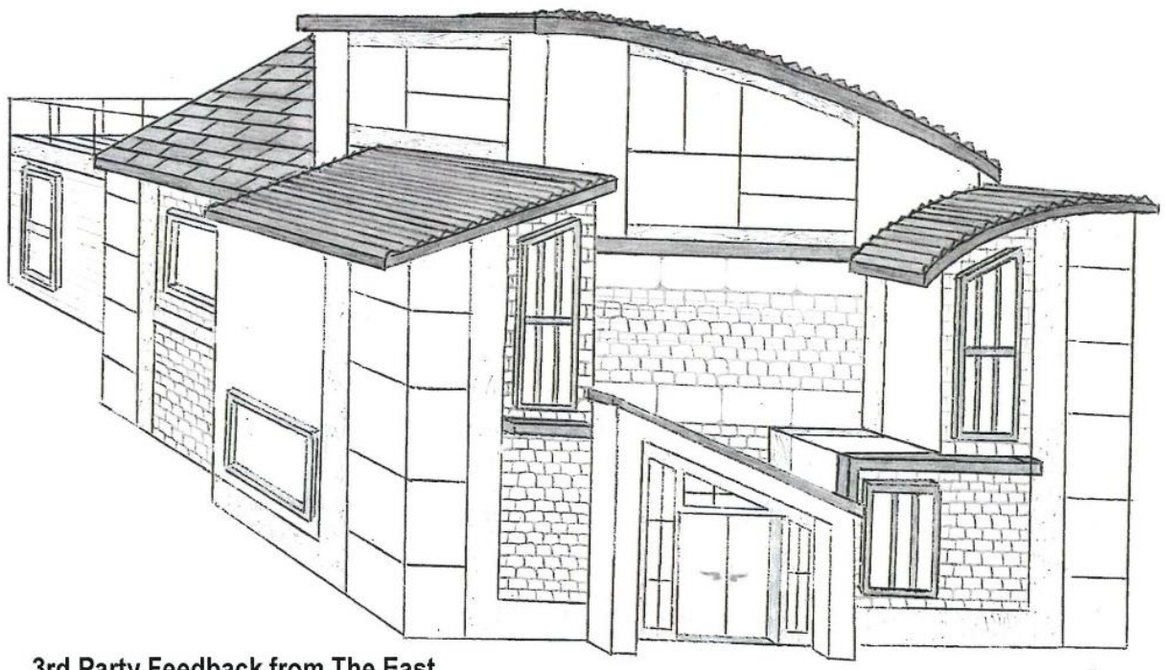
The specification has been mostly met regarding materials and sustainability because:

- A lot of the materials used here are sustainable, the oak cladding coming from FSC approved forests which replant trees after cutting them. I will attempt to find reclaimed limestone bricks (so more limestone doesn't need to be mined). The steel on the house exterior as well as the foundations will be recycled. Etc. However the fibreglass window frames cant be recycled as well as the tempered glass windows. All of which are very durable and unlikely to need replacement within the next 10 – 20 years.
- The slate on the roof (that isn't part of the thermoslate) will be reclaimed so more doesn't need to be mined, so less drain of natural resources. Environmentally sufficient overall.
- The rainwater collection system isn't the best option for this property. Since all the sloping roofs lead to the front of the house, and the remaining roof surfaces are all flat so no water flow. My clients prefer to have the collection tanks at the rear of the house.

Scale of Manufacture / Cost:

- This house is still going to be a one-off product designed specifically to my clients needs, wants and values. This will not be built anywhere else.
- Predictions for the cost to construct this property still remain within budget.

Design 3 Review



3rd Party Feedback from The East Northamptonshire College Students:

Joe: The blending of windows into the wall structure at the corners adds a nice aesthetic, but it could compromise the strength of the walls. Whilst different types of roofing improves the unique appearance, the contrast between the two could also create a negative view rather than positive. The balcony adds a nice touch to the house that really helps the feeling of having a bespoke property.
Amy: "This design is my favourite ; all the materials, facades and shapes fit together wonderfully. Curved slate roofs add natural forms to contrast the sharp corners. There is enough interest to the faces without sacrificing functionality and the balcony at the back of house provide vital outside space. On the other hand , the window don't fit the uniform look of the rest of the house , one style should be picked to replicate (the large glass wall would differ slightly).
Brandon: "This house has the most unique roof structure out of the 4, I like the way that the pitch at the back contrasts with the curved roof sections at the front. The windows are nice on the top floor, however the windows at the front have too many bars over them and they are too obstructed."

Client Feedback:

What do you like about this design / what wouldn't you change?	"We would like to keep the main design as it is, since it is unique and has good character for a modern building. We like the varied sloping roofs here too. There is a lot of glass too which is what we want, plenty of natural light can come in."
What do you not like about this design / what would you improve?	"We feel like we would remove the separations in the windows, there isn't a lot of space to see out of. We would also remove the corrugated metal on the roof, and replace with a smoother rubber membrane, as we don't like the current look"
How do you feel about the general shape of the property?	"This is our favourite shape so far, we love the fact that it is modern but not a blocky structure. Very unconventional roof designs are different yet very satisfying. The three section idea is a great idea with a large rooftop deck at the back perfect for us."
Does this meet your needs and wants / would you live in this house?	"This house has strongly met our wants of a house we love the look of where it is unique uses a range of different shapes and materials, and stands out. Our needs have been met (size and loft storage space), but we do not see a garage here. We would live here."

Function:

The specification has been mostly met for this design because:

- This house is large enough to fit 5 bedrooms and bathrooms, loft space in the pitched roof to the rear, and all other essential rooms. Suitable for my client's family. Important need accounted for.
- The plot location hasn't changed, the property will still be located in a rural village of Hale, Manchester. Which my clients both approve of. They will be happy to retire here.
- This house has a Thermoslate roof for the pitched section of it. The curved parts do not however, so this is potential wasted space since no Thermoslate or solar panels can be fitted. The rainwater collection system will work really well with this roof design however.
- The general shape of the design fits the plot well, both being an elongated shape. There are no overhanging structures coming off of the exterior walls so no worries about building regulations. (No parts of the house will hang over into other properties).
- A pitched roof can be located at the rear of the structure. Plenty of storage space here so my clients should be satisfied since I have met one of their crucial needs.

Form:

Visually, this house has met the specification well because:

- Design-wise this property is quite unique, the curved roof gives nice variation to shape and this is perfect for my clients since they have always wanted unique elements to their property. There are more unique elements e.g. the front porch area as well as the corner windows running up each corner.
- Many large rectangular windows can be seen, running up the corners of the house, as well as the large ones on the roof. However the three windows at the front need to be more open and have less bars to give more of a view and let more light in from the front.
- A Nice mix of materials can be seen on the exterior walls, with different sizes of limestone brick, oak cladding, darker steel frames and a slate roof give a much nicer aesthetic than a generic red brick build.
- The property isn't unsightly or doesn't use any vibrant colours so it will fit in with the rest of the village and will not cause any visual pollution to the area.
- All windows frames are fibreglass frames here, and are in a similar shade to the stainless steel frames and the Thermoslate on the roof.

User Requirements:

My clients needs for the property have been met well here because:

- There are still plans for 5 bedrooms and 5 bathrooms, with 4 en-suites which will cater for the client's need for the whole family to have their own personal rooms / space.
- Enough space has been set aside for the annex area for my client's elderly relative, my clients needs have been met here.
- The underfloor heating dry system is still planned to be installed, even though it isn't visible on the drawing here.
- Rather than a large porch at the back, there is a rooftop deck for a table and chairs to be set up. Even though there is less shelter there is much more space.
- Plans for bifolding doors at the rear of the house opening up onto the rear deck are still there and will be constructed, perfect for the summer months and meals outside.

Performance Requirements / Safety:

Safety requirements met and my clients are happy with the property because:

- After feedback from my client's their reaction to this property was very positive and they have said that they would be happy to live here. They like the unique design as well as the material choice.
- All materials are very durable and wear resistant, are unlikely to corrode / break down over time (e.g. the stainless steel used has a natural corrosion layer to last longer).
- The foundations will be within the requirements of building regulations, dug over 1.5m deep and filled with concrete and steel beams for extra support.
- Elderly relatives have been considered here, although there are no ramps there is no need for them since the door is not elevated by steps so it is easy access.

Material Requirements / Sustainability:

The material requirements have been met well because:

- The majority of the materials are durable environmentally friendly because either they have been reclaimed or are able to be recycled after use. For example the limestone and slate will be reclaimed to avoid unnecessary mining of the raw materials. The timber is sourced form forests that replant trees after cutting.
- Cavity wall insulation will be installed in every wall to trap air and reduce heat loss as well as loft insulation.

Scale of Manufacture / Cost:

Specification met here because the house will be built ONLY for my clients and is estimated to be within budget. (Important needs met)

Design 4 Review

3rd Party Feedback from The East Northamptonshire College Students:

Joe: "The amount of windows around the property allows plenty of natural light in but limits the privacy, which is an important factor to me. The roofing looks sleek and the wood cladding gives an enjoyable modern feel. However if feel that the general shape of this house is too blocky for my tastes, I prefer the other designs more."
Amy: "A smart desirable modern home. Interesting use of slanted and flat roofs plus the incorporation of rectangular stone pillars to break up the lines of the building. Assure that the flat roof if properly coated to avoid water damage. The pitched roof second from the left might cause also lead of water damage as the water will run towards the brick work soaking the stone, weakening the structure. If a discrete gutter or adjustment of the angle was changed these problems should be avoided."
Brandon: My favourite element of this house is the rendered pillar idea round the first floor. I think it takes away from the house just looking like a box. I really like the design of the front door and the double garage, especially how they match in a similar modular design.

Client Feedback:

What do you like about this design / what wouldn't you change?	"We like the idea of the large open windows that run the lengths of the upstairs rooms, The roof is the best part to this design because it adds more angular structures and takes a little away from the block look."
What do you not like about this design / what would you improve?	"We are not so keen on the pillars on the corners or the ledges above the front door and at the rear. We would like to see these removed as we think they will be difficult to clean and maintain."
How do you feel about the general shape of the property?	"The design here is very modular, more so than the others. The different roof angles make this design modern and interesting, which is exactly what we need. However the garage would be best brought out away from the house, we feel."
Does this meet your needs and wants / would you live in this house?	"This meets our needs well since it's environmentally friendly, plenty of Thermoslate providing renewable energy sources whilst using mostly renewable materials. "Our wants of a less blocky house however hasn't been met. We wouldn't live here."

Function:

I didn't think this design met the function criteria as well as it should because:

- This design is the smallest out of the 4 designs, I am not very confident that this building will be able to fit 5 bedrooms and 5 bathrooms (and still keep room for large kitchen and living spaces) like the other designs can. This is a crucial requirement that has not been met so this design will not be used in the final construction.
- The house will still be built in the rural village of Hale on the outskirts of Manchester. My clients have already said that they will be happy to live and retire in the village.
- The house does include the rainwater collection system to improve environmental sustainability, since the roof structure is mostly pitched so the water runoff will be effective. As well as the thermoslate acting as the solar panels on the roof.
- The shape of the property is more elongated than it is wide so will be able to fit the plot, but it will not fit as well as design 1 and 3, so space will not be as maximized.
- The roof is mostly pitched so there will be plenty of storage space for my clients and their family's belongings.

Form:

The requirements for design and form of the house have been met fairly well because:

- This design has a fairly unique style to it, however it is the most blocky design out of the four, meaning it is the most generic design. But still unique enough to satisfy my client's needs for change.
- All windows on this design are large, open and rectangular (with varying sizes too), this is exactly what my clients wanted.
- There is a variety of different materials used on the exterior house walls, from fibreglass to limestone bricks and light oak cladding and _Oak_ garage doors. Many different textures and colours to satisfy my clients wants.
- No visual pollution will be created here, there are no unusual colours to the house so will fit in nicely with the rest of the properties in the area. Nor will the house be a very large overhanging structure compared to everything else.
- The window frames are fibreglass so the clients wants have been fulfilled here too.

User Requirements:

My clients will have most of the requirements they need in this design (but not all) because:

- With the current house size a 5 bedroom 5 bathroom house with all other rooms included may not be possible with this design due to lack of space. Mainly due to the garage being integrated into the main structure of the house. This is the only let down with this design. My clients may have to work with 4 bedrooms / bathrooms if this were to be chosen as the final design.
- There are still plans for the annex area for my client's elderly relative, located on the ground floor, as well as all rooms to be laminate wood flooring and be underfloor heated with a dry system. They just can't be seen on an exterior view.
- A large back porch will be built in the garden, a large set of bifolding doors will open up onto the decking to cater for family gatherings in the summer time (just as my clients wanted), the view of the design doesn't show this but there are still plans for construction.

Performance Requirements / Safety:

Safety requirements met well, performance requirements in the view of my clients have not been met because:

- My clients have had the least positive response to this design compared to the other three, mainly because of the bedroom and bathroom they will have to sacrifice. The overall shape is their least favourite but they do like some elements to the house that will be integrated into future designs (the rendered pillars and the garage door materials and design). Specification not met here.
- The foundations will be the same as the other designs meaning that they will be dug deeper than 1.5m and keep to the guidelines of building regulations.
- No ramps needed for wheelchairs since the front and back doors are not elevated high enough. Considerations inside will not be needed as much due to the annex being located on ground floor.
- During construction, the room and door heights will be measured to the standard building regulation sizes. Genral building requirements met here.

Material Requirements / Sustainability:

The material and sustainability criteria has been met very well here because:

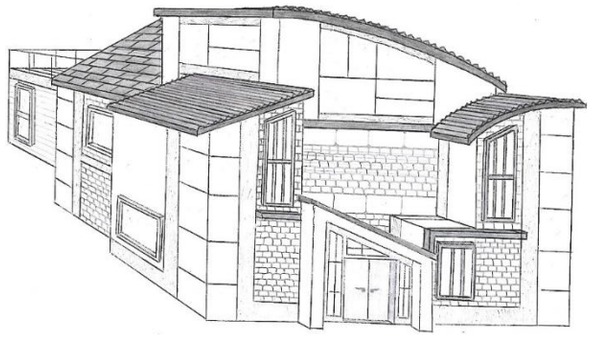
- Most of the materials have been either reclaimed form a recycled source or are able to be recycled in the future making this house an environmentally friendly project and will have minimal harmful effects on the environment. All timber (all doors, internal framework, cladding and garage) has been sourced from an FSC approved forest meaning replantation. Slate tiles and limestone bricks have also been reclaimed to reduce need for mining new rock.
- The correct level of cavity fibreglass and foam wall and roof insulation will be installed between the walls to reduce heat loss and save on energy bills in the winter.
- Foundations will have steel as well as concrete to improve structural stability.

Manufacture Scale and Cost:

The house is a one off project which is aimed purely at my clients and them only. This house will not be built elsewhere. The cost of this house will certainly remain within budget due to its smaller nature in comparison to the other designs.

Design Development 1

Previous Development



Client Comment:

What We Like: This is a very nice improvement, we love the new house shape, with it being more elongated rather than a boxy looking front. The overall look of this house is far more contemporary and what we want. The larger and more open windows without those thick separations are far more contemporary looking for us and will let in more of the natural light that we want, especially how there are way more of them too.
The balcony at the front s a very nice addition that we never knew we wanted so much, it looks far tidier and modern at the front with the glass panels and the bifolding doors.
We like the introduction of the steel cladding, the windows were an interesting idea but this is much better for us.
What Should Be Improved: Our main concern is that there isn't a garage with this property, one of our main requirements was that we need a double garage for both our cars and our bikes, we need to see this in the next development. Also we would like to see the entrance structure with a curved roof similar to the top roof rather than a slanted straight roof as we don't like the look of it that much. Also we feel like the corrugated metal roof just doesn't suit our preferences, we would much prefer a smoother material to make the roof look less industrial and more home- like for us. However we would like to keep the same colour as the slate at the rear.

Changes: Windows (further Research on Tempered Glass):

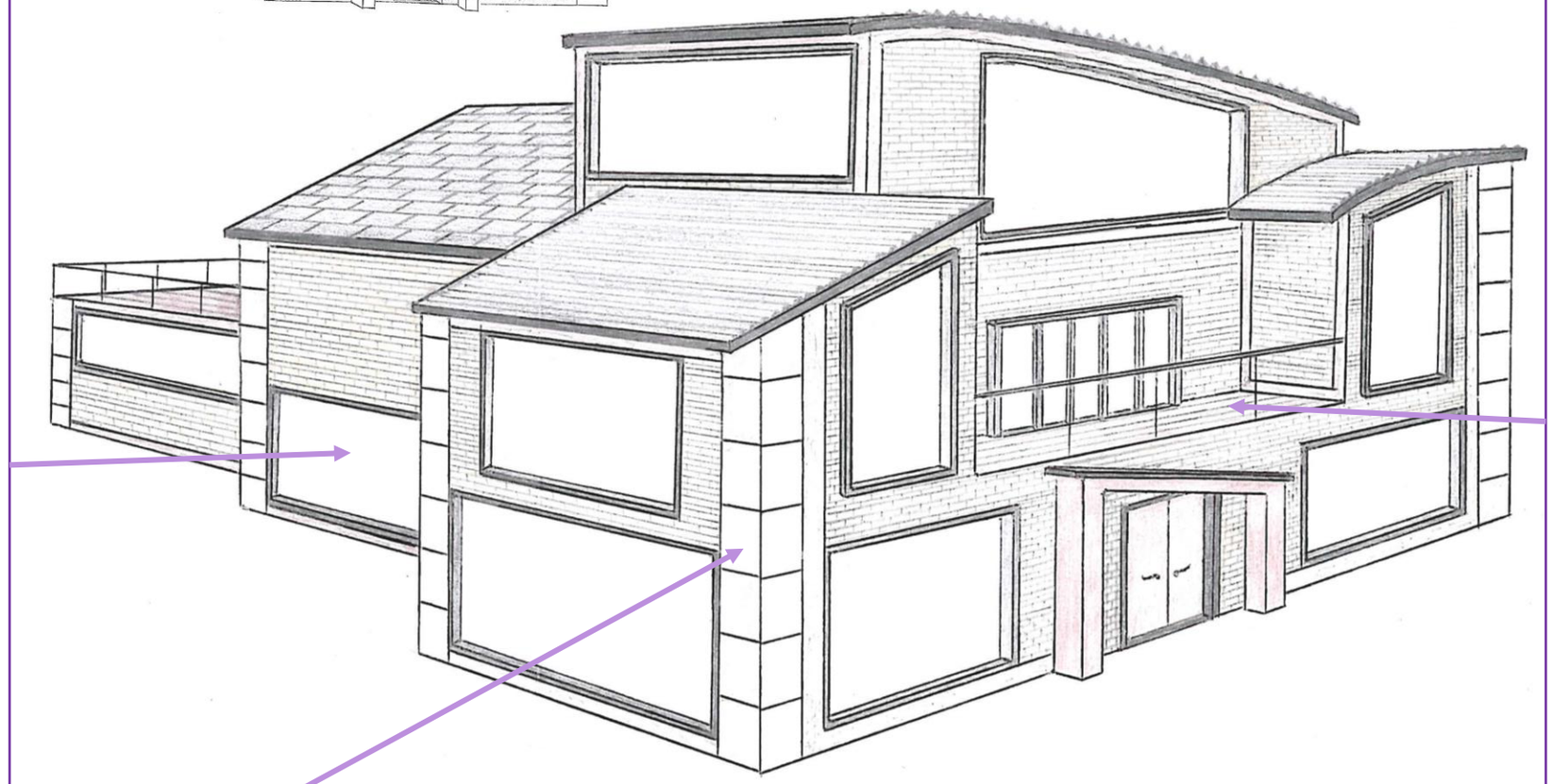
Originally, there were fewer and smaller windows around the design, the windows at the front would have thick separations which my clients said would obstruct their view too much, I also received a request for larger windows. So I removed all separations in the windows, opened them up and made them all larger. Allowing more natural sunlight into the house and creating the light and airy atmosphere my clients want inside the building. Which also gives the property a more contemporary look as opposed to the more traditional previous look.

Construction:

Materials: The glass used will be double glazed tempered glass. The double glazing creates a trap of air which improves insulation, the tempering of the glass improves safety (will shatter into smaller harmless shards) and strength. The window frames will be dark grey fiberglass to match the thermoslate roofing and reinforce the more contemporary look.
Manufacture: Glass manufactured using sand / silica, sodium oxide and limestone, mixed and put into a furnace at 1500°C, poured into a window pane mould, then cooled and cut into the right dimensions. Finally being sealed the frame with a silicone sealant to improve insulation and waterproofing properties.

Model:

Materials: The frames will be made from a dark grey acrylic, (modelled on CAD then cut out precisely and cleanly by the laser cutter), because it is very hard, abrasion resistant and widely available. Same goes for the "glass", clear acrylic will be used here.
Manufacture: Windows will be cut out of the MDF wall. Using a pillar drill to allow access for a coping or Tennon saw to cut out. The clear acrylic (sized and cut by the laser cutter) will be glued to the frames with modelling adhesive. (e.g. UHU Glue).



Changes: Corner Cladding (Further Research on Steel Cladding):

In my initial design, there were windows which ran up the corners of the building, I thought that the windows took up too much space and didn't give off the contemporary look wanted. Also structurally, this was a very bad idea since it is almost essential to have solid corners to a house. So I removed the windows and replaced these with a thinner, similar look of stainless steel cladding plates attaching to the underlying brick.

Construction:

Materials: The stainless steel sheets will be around 3mm thick and sealed with a polyurethane / silicone adhesive. A rubber membrane may be needed behind the panels for waterproofing. An advantage is that the cladding will be very easy to clean and maintain due to the nature of the material, also the cladding is 100% recyclable, keeping the environmentally trend. The steel is very durable and resistant to corrosion meaning there no replacement of materials over time.
Manufacture: Iron ore is put into a blast furnace at around 1700 Celsius to smelter out the impurities. Melted and cut into panels. All sheets are fully bonded to the substrate using a two part polyurethane adhesive, which leaves no gap between the sheets and the rear wall, which allows no moisture access. A rubber membrane may be installed beneath the panels.

Model:

Materials: I will have one strip of grey shiny acrylic running up the corners of the house.
Manufacture: The separations in the acrylic will be done by the precise laser cutter and stuck to the brickwork (MDF) by a modelling adhesive. (UHU Glue).

Changes: Balcony:

In my original design there was a large enclosed space between the two pillars at the house front, I utilised this space to create a small balcony, and added a bifolding door as an entrance, it seemed like wasted space before. Which now provides a small standing / seating area at the front of the house whilst also tidying up the look of the front, creating a more clean and stylish look with the introduction of the tempered glass barriers. Before the change, the house looked very traditional, the added glass improves the contemporary look my clients are looking for.

Construction:

Materials: The same decking boards will be used as the rear deck. Still the very aesthetically pleasing Red Cedar, being water and decay resistant also. The timber is chosen for better material variation rather than having oak everywhere. Bifolding doors will be made from an aluminium frame with tempered glass. The glass panel barriers are also made from tempered glass with a stainless steel circular handrail.
Manufacture: The Cedar decking will be laid over the top of a watertight EPMD rubber membrane which will stops any rainwater from entering between the planks The Cedar planks will be nailed to timber battens facing perpendicular to the cedar for strength. The bifold door will be bought pre- constructed and then installed. The glass panels will be constructed using sand / silica, sodium oxide and limestone, mixed and put into a furnace at 1500°C, poured into a window pane mould, then cooled and cut into the right dimensions. Similar to the windows. Stainless steel handrail will be installed and attached using reinforced epoxy for extreme strength.

Model:

Materials: A thin sheet of Laser MDF will be laid over the top surface of the balcony. Dark grey acrylic will be laser cut out into the bifold door shape with clear acrylic glued inside. Clear acrylic also used for the glass panel barriers.
Manufacture: This sheet will be laser cut then laser etched to show the plank lines on the surface, consistently and accurately with the laser cutter. Then stained a light reddish colour to represent Cedar. Then finally glued using an all-purpose adhesive. Glass barriers are also clear acrylic for the optical clarity aspect. Handrail will be a thin strip of grey acrylic cut out with the laser for accuracy.

Design Development 2

Changes: Entrance:

On the previous design the structure surrounding the door had a flat roof slanting at a much too steep angle which looked out of place on the house, now I have given it an archway to match the other curved roofs. Finally I removed the door-side windows since they looked very cluttered and unnecessary.

Construction:

Materials: A large square section of oak will make up the doorway, with a curved section connection the two. Over the top will be a curved sheet of steel with a rubber membrane over the top for waterproofing.

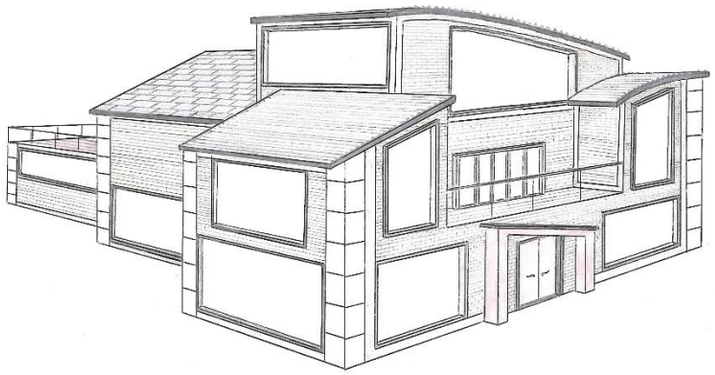
Manufacture: The curved section will be sanded, and jointed to each of the vertical square sections via a mortise and tenon joint the steel sheet will be heated (1100 Celsius) and forged into a curve to fit the curved section oak. then rubber membrane laid out / wrapped around the steel. Membrane then nailed to the steel to stay secure and waterproof the roof.

Model:

Materials: Door made from a thin sheet of MDF, door separation and handles etched on using the laser. MDF also for archway and dark grey acrylic on top for the roof.

Manufacture: MDF cut out using a band saw then sanded, then varnished to fit the oak colour. Dark grey acrylic cut using the laser cutter for accuracy.

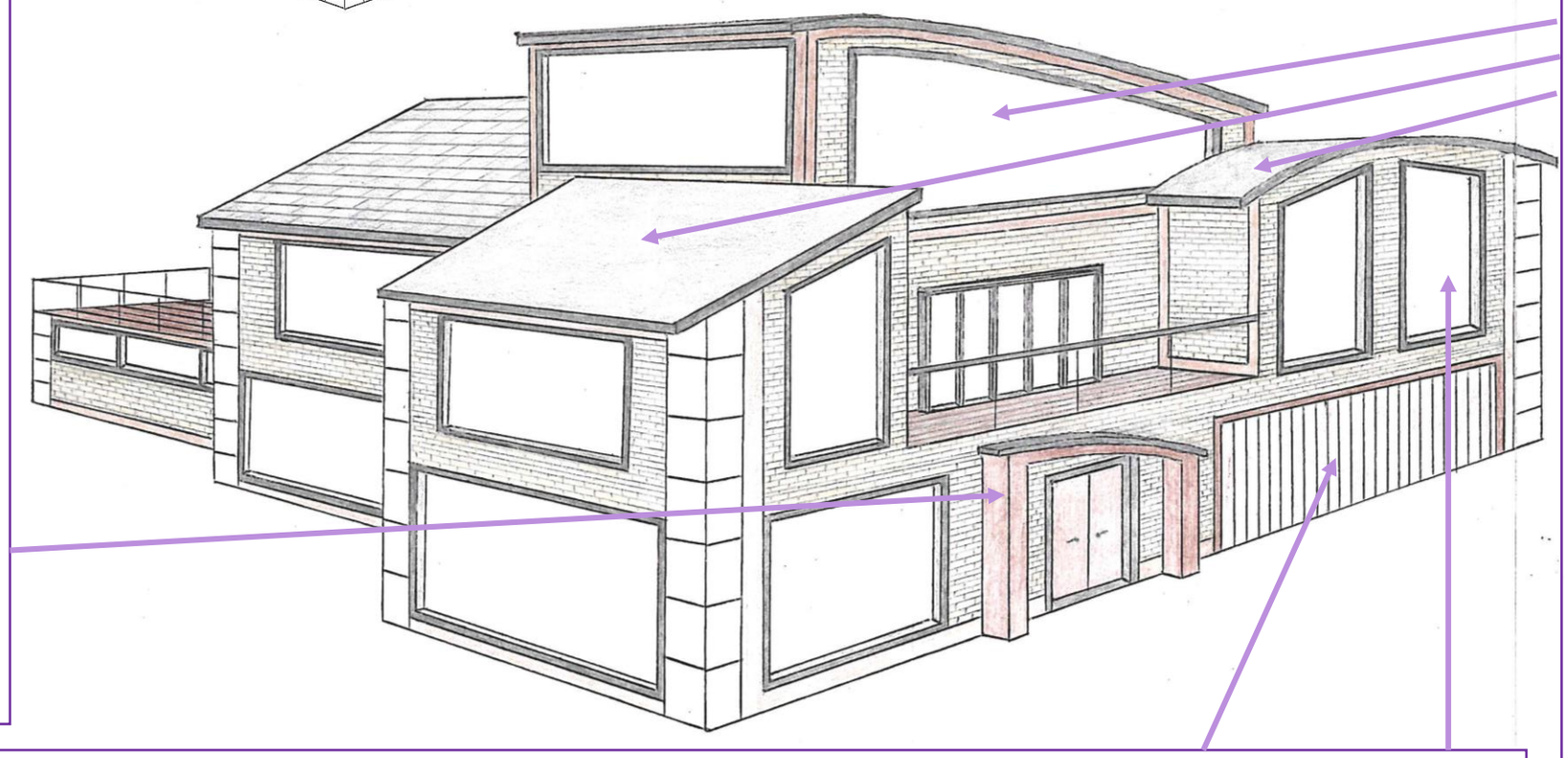
Previous Development



Client Comment:

What We Like: We are very happy with this design now, since we have the double garage that we need, that was the only thing keeping us back from liking the design previously. The extension that came with the garage is marvellous, it improves the shape of the house further and makes it look a lot bigger from the front. Also the roof looks a lot nicer now, we like the idea of the rubber surface, being very smooth and dark grey to match the slate. Finally the large window at the front looks a lot nicer being the full length of the top floor.

What Should Be Improved: As much as we like large open windows, we feel as if they are a little plain, if there could be a more interesting design it would complete this house for us. The same thing goes for the front door and garage door, they both look a little plain and boring, so we would like to see a more interesting design for both of those.



Changes: Double Garage Extension (Further Research on Cedar):

My clients were concerned that I didn't include a garage as they requested initially in the previous designs, so I extended the right wing of the house to accommodate an internal double garage, this also meant wall space for a second window mirroring the previous, also the roof is mirrored and sloped down the other side in an arc shape. This also allows more first floor space to compensate for the garage space.

Construction:

Materials: Only new materials are from the garage door which will be made from Cedar rather than oak to give a greater colour variation to the house. An oak frame matching the rest of the house will surround the garage door made from multiple oak planks. The garage door will have steel cables and a torsion spring to help with the opening and closing. The Cedar was chosen because of the high resistance to decay and insect damage, also it has a straight grain and is easy to work in cutting and construction, more importantly my clients like the dark reddish colour alongside the oak cladding. It just comes with a price.

Manufacture: A large timber frame will be made to fit the dimensions of the garage, cedar planks will be nailed to the frame vertically and will be one piece. It will have an up-and-over system where the door opens up vertically and rolls back along the interior ceiling, a torsion spring attached to steel cables will lift the door. It's a easy and no-hassle operation.

Model:

Materials: The garage door will be made from a thin sheet of MDF, much like the majority of the model. Since the door will not be fully functional in the model, it is only aesthetic and will not need all the internal elements like in reality. Now more MDF will be needed due to the size increase of the building.

Manufacture: The MDF sheet will be dyed a darker colour using tea bags or varnish to resemble Cedar. The sheet will be laser cut to show uniform vertical lines to represent planks. A thin frame of MDF will be glued to the inside of the opening. No need to worry About the internals, since the garage door will not be fully functional in the model.

Changes Roof & Top Window (Further Research on Galvanisation):

Previously the roof was made out of corrugated galvanised steel, after discussion with my clients, they do not like the industrial look of the roof, instead they suggested a smoother surface. Now the roof has a smooth, rubber, waterproof surface which now looks much more clean and contemporary. This way the roof still matches the colour of the Thermoslate pitch at the back. Also the top curved window at the front seemed too square and needed to stretch the length of the top section, now the window fits the shape of the roof more.

Construction:

Materials: I have decided to make the roof out of a curved sheet of galvanised steel with a thick layer of EDPM rubber membrane over the top for its strength, waterproofing and durability. Galvanising the steel allows it to become highly corrosion and rust resistant, keeping its look for tens of years. It gives a reliable protection which covers the entire surface. Overall offering a lower Long-Term cost.

Manufacture: Stainless Steel sheets are heated to around 1100 Celsius and are forged to the shape of the roof, then the sheet is dipped entirely in Zinc, which Galvanises it. Then the rubber membrane nailed to the surface. A vapour control layer will be added as well to prevent moisture entering through the roof.

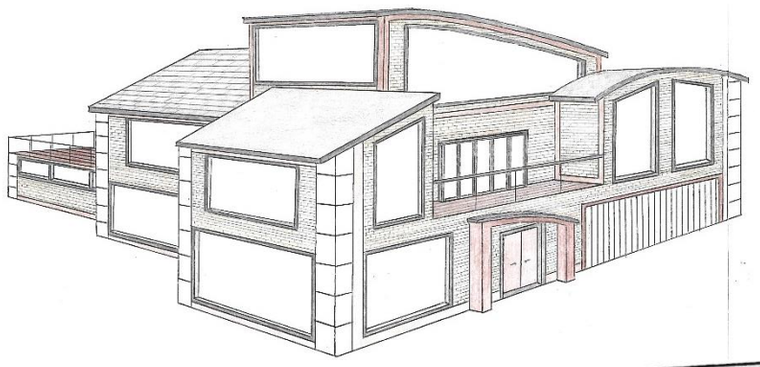
Model:

Materials: MDF will be used for the roof, grey fine glass paper for the surface material.

Manufacture: Curved roofs cut using a scroll saw and sanded using a sanding drill (concave surface) and a belt sander (convex surface). Layers of dark grey fine glass paper will be laid over the top to represent the rubber membrane. Attached using UHU modelling adhesive for a long lasting and reliable hold.

Design Development 3

Previous Development



Client Comment:

We love the shape of the property as well as the contemporary style whilst keeping to some traditional elements of the limestone bricks, oak cladding and slate roof. The new window designs are fantastic and we love the style, only making it more contemporary and stylish. The garage door has a much better design to it now, we like the look of the off-centre windows and the choice of Cedar panels. The colour scheme of the whole house is really nice, in face, and we love the way it turned out. Finally the front door is much improved now, looking a lot better than the plain door previously, we like the addition of the cedar cladding as well as the window. As good as the feature windows are we feel like there are too many separations, if some of them were removed then there would be perfect visibility.

Changes: Window Design (Further Research on Fibreglass):

The windows on my previous design were all separated and fairly basic, even though they were in a contemporary style, I decided to give the windows a more unique and "feature window" like design. Involving a more interesting design with some small window separations that do not obstruct my clients view like on my initial design. Connecting the two mirrored windows above the garage, connecting the two left wing windows as well as the side windows being larger and improved design.

Construction:

Materials: The window frames and separations are all made from dark grey fibreglass for its superior weatherability and resistance to a broad range of chemicals. It is also a good insulator, and will be essential for preventing warm air escape. It has an impressive 80 year life expectancy without any maintenance required. The windows themselves are still made using double glazed tempered glass so no change here.

Manufacture: A series of fibres are brought together and enter a resin bath, they are then pulled through a die, heated and then painted dark grey. The tempered glass is still manufactured the same way.

Model:

Materials: The fibreglass frames will be represented using dark grey acrylic, this best fits the look and is widely available to us during making. Windows will still be made from clear acrylic for its optical clarity and abrasive resistance.

Manufacture: The window frames will be cut out in the laser cutter, previously designed on CAD they will be glued to the inside of the square opening in the MDF, the clear acrylic will also be cut out in the laser cutter and glued to the frame also using UHU adhesive, the separations will then be cut out separately and glued over the top of the clear acrylic.

Changes: Garage Door:

On my previous design, similar to the front door, it was really bland, plain and uninteresting and feels out of place on the house, according to my client comments . I have now changed the direction of the panelling and added some small windows for design purposes. Now the garage is more interesting and has a more contemporary look.

Construction:

Materials: The door will still be made from Cedar rather than oak to give a greater colour variation. The oak frame is now a fiberglass frame to match the rest of the frames round the property. Garage door will still have steel cables and a torsion spring to help with the opening and closing.

Manufacture: A large fibreglass frame will be installed, Cedar planks will be nailed to the frame horizontally and will be one piece. It will have the same up-and-over system where the door opens up vertically and rolls back along the interior ceiling, torsion springs attached to steel cables will lift the door.

Model:

Materials: The garage door will also be made from a thin sheet of MDF. Clear acrylic for the windows as well.

Manufacture: The MDF sheet will be dyed a darker colour using tea bags or varnish to resemble Cedar. Which will be laser etched to represent the wood panels and the holes for the windows, which will be filled on with clear acrylic.

Changes: Front Door:

On all my previous designs the front door was always plain and bland, my clients requested a more contemporary and stylish entrance to their grand home. The new door has a window at the top and various strips of timber cladding creating a far more interesting pattern than before. Also the thinner double doors are now one door.

Construction:

Materials: The door will be a solid oak door with Cedar cladding panels creating the design, I chose these materials because they match the materials and colour scheme used elsewhere in the property so the door doesn't look out of place like the previous door did. A fibreglass frame will surround the door.

Manufacture: Multiple pieces of solid oak are bonded tightly together in different directions and offering far superior strength and stability than utilising just a single piece of wood. The door will not veneered since the door will be far less strong and durable. The Cedar will be installed on top using Cascamite Powdered Resin Wood Glue for extreme strength and durability outdoors.

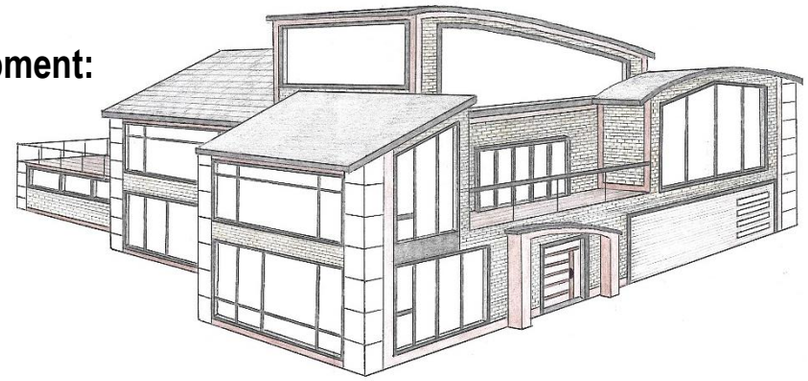
Model:

Materials: Thin sheet of MDF for the door and brown acrylic for the Cedar cladding and dark grey acrylic for the fibreglass frame.

Manufacture: A thin sheet of MDF, and a dark grey acrylic frame will be cut out using the laser cutter. Then stuck onto the house using UHU modelling adhesive. Then the Brown acrylic will be cut out with the laser as one piece and the "Cedar cladding" will be stuck on as one piece with adhesive also.

Design Development 4

Previous Development:



Changes: Front Door (Further Research on Concrete Paving):

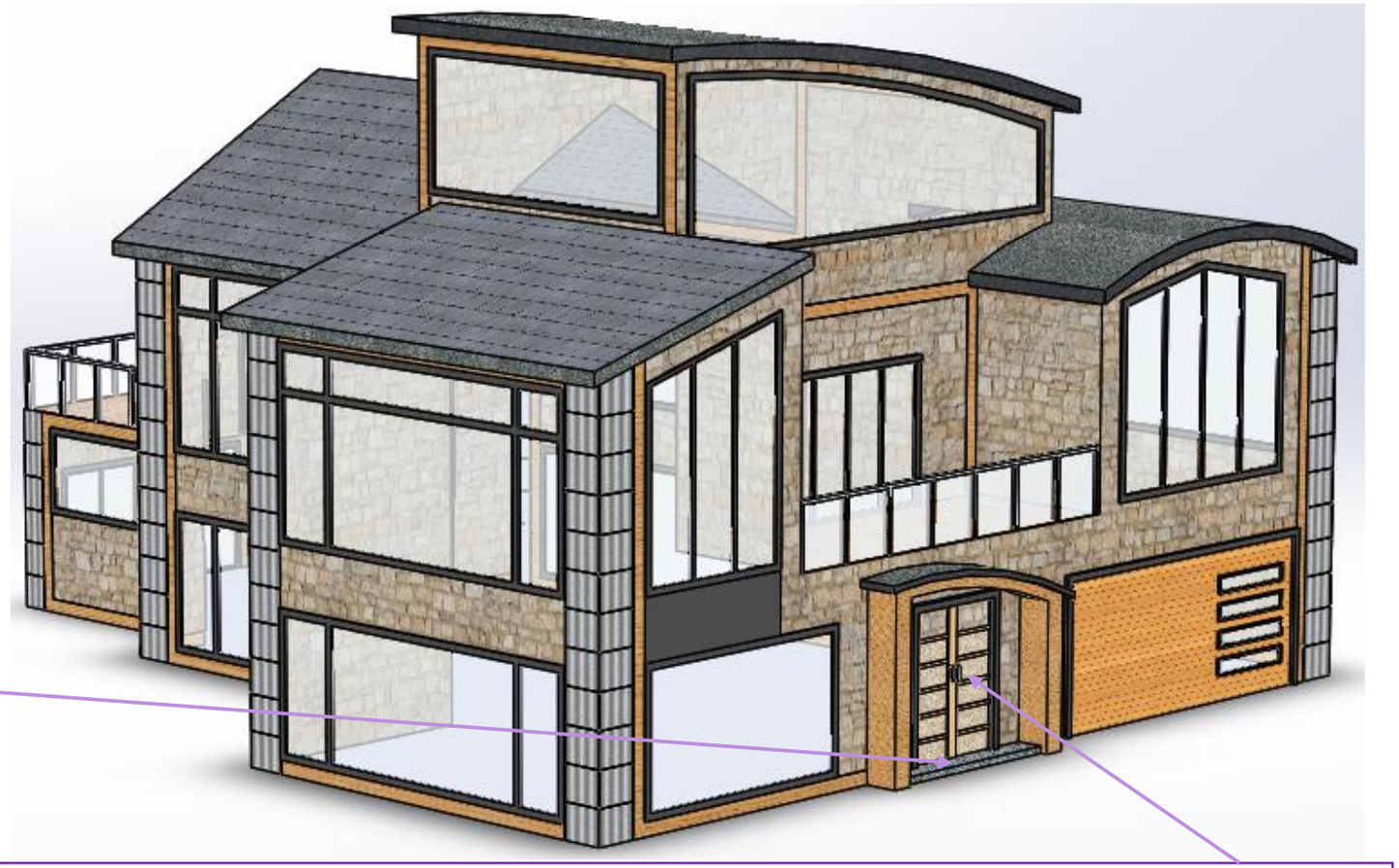
My past designs have had the front door level to the ground, which won't be practical since it allows rainwater to build up around the front door and possibly leak in, now I have a small paved step to fix this issue, the dark grey fits in well with the design and separates the door from the floor. It is a Minor adjustment but essential to comply with building regulations.

Construction:

Materials: The step will be made from dark grey concrete blocks laid together.
Manufacture: First, concrete will be poured into a mould along with a darker grey colouring agent then dried. The concrete blocks will be laid in front of the door, they will be laid on top of a wet concrete foundation and left to dry.

Model:

Materials: I will use MDF as the majority of the thickness, with a grey card surface to give the appearance of the concrete.
Manufacture: The MDF will be cut with a scroll saw and sanded with a belt sander. The card surface will be laser cut to have a block paved surface, then stuck on using modelling adhesive.



Client Comment:

We are really pleased how the brickwork looks when put together with the dark grey roofs and window frames, it makes the house look like an old building modernised, which really keeps to the old-meets-new style that we were asking for. Overall ,we are very happy with how the colour scheme looks now, especially with the addition of the stainless steel cladding on the corners. We weren't very sure how the combination of slate shingles and rubber membrane would look together for the roof, but we are happy with the material choice, looking at this. The feature windows look even better now that they are slightly more open with less separations, it is enough to keep them interesting without sacrificing visibility. The changes to the entrance were much needed, the paving step is a nice addition and the double door makes the entrance look more grand whilst keeping the design that w like. We are very happy with this design now.

Changes: Front Door (Further Research on Stainless Steel):

Previously I had a single door entrance to the house, upon experimenting with different styles of door I found that a double door suited the property much more due to the width of the front, I felt that a wider door was needed. I took the design from the previous development and reflected the design onto both sides giving a new symmetrical design. I kept the same doorframe height but decreased each doors width. I redesigned the door handles to be a stainless steel rectangular handles which can simply be pulled rather than turns and pulled, they are used all around the exterior of the house on all bifold doors. I feel they are extremely modern and fit the design of the house well.

Construction:

Materials: Door handles are my only change in materials (so this will be the focus) made out of stainless steel because the shiny silver appearance is extremely modern and is preferred by my clients as their current house includes them. The door is still light oak with Cedar separations, no change of materials.
Manufacture: First the raw materials (Iron Ore, Chromium etc.) are melted in an electric furnace, the molten steel is the cast and cut into the door handle shape using a guillotine knife. The steel then undergoes annealing treatment (heated the cooled to relieve internal stresses in the metal), then descaled (annealing causes a scale / build up on the metal), then finished with a polishing abrasive.

Model:

Materials: The door handles will be small pieces of light grey acrylic, which will be stuck on using UHU modelling adhesive. The dark fibreglass window frame will be modelled as grey acrylic and the separations will be darker / stained MDF to give colour variation.
Manufacture: The door will be a small indent in the surface of the house front, the door will not function as this will over complicate the model. All acrylic and Cedar details will be laser cut for accuracy on a small scale, then glued on with modelling adhesive.

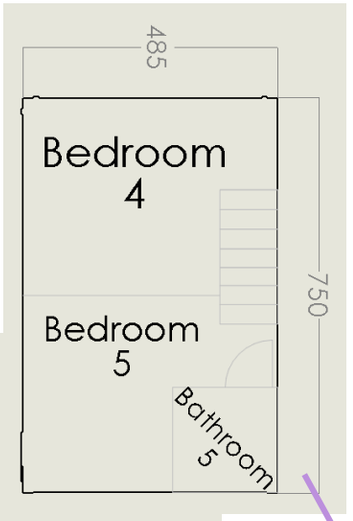
Changes: Windows + Overall Shape:

Me and my clients felt that the last development had slightly too many separations, and I needed to find a better compromise between stylish and simplicity. So I removed the amount of separations on the rear kitchen windows, making them an entire window. The two left side windows have one or two less separations to increase visibility. Finally I completely removed the separations from the front window as I felt it was a little excessive last development.
The front of the house is slightly less wide, this was in order to fit the narrow plot better, because I felt that the previous design would not fit. This involved decreasing the length of the double garage to the minimum required length so that I could bring the walls in closer.
The final changes were decreasing the length of the house rear and increasing the height of each floor so that they were the minimum required 3m and were in proportion.

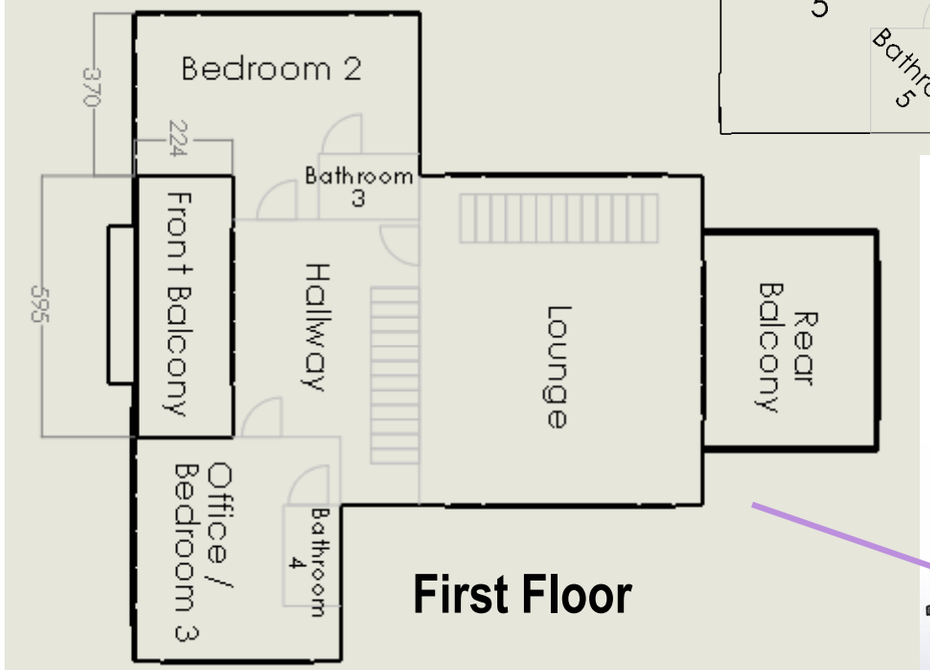
Final Design

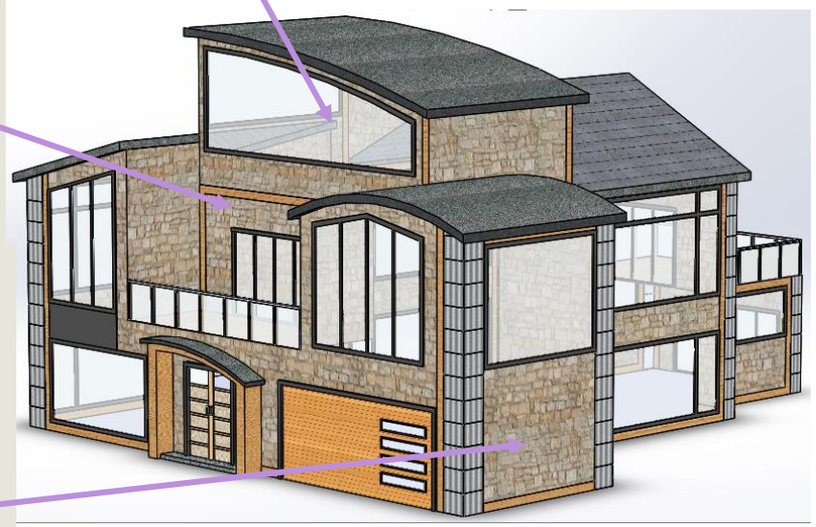
(All units in cm)

Second Floor

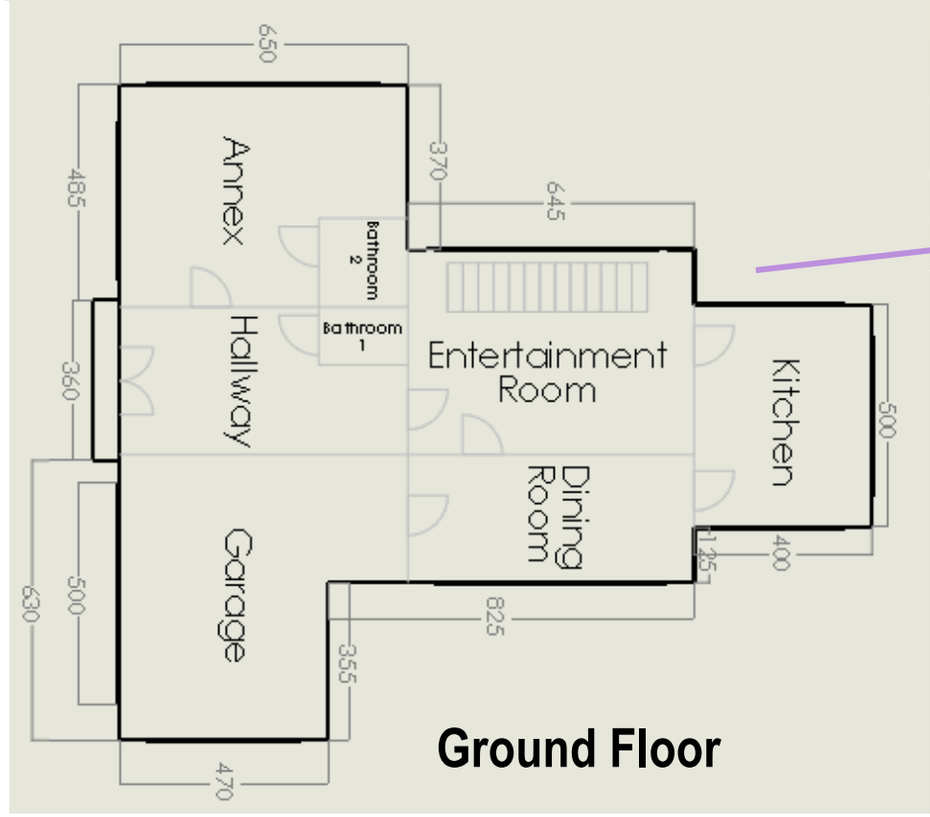


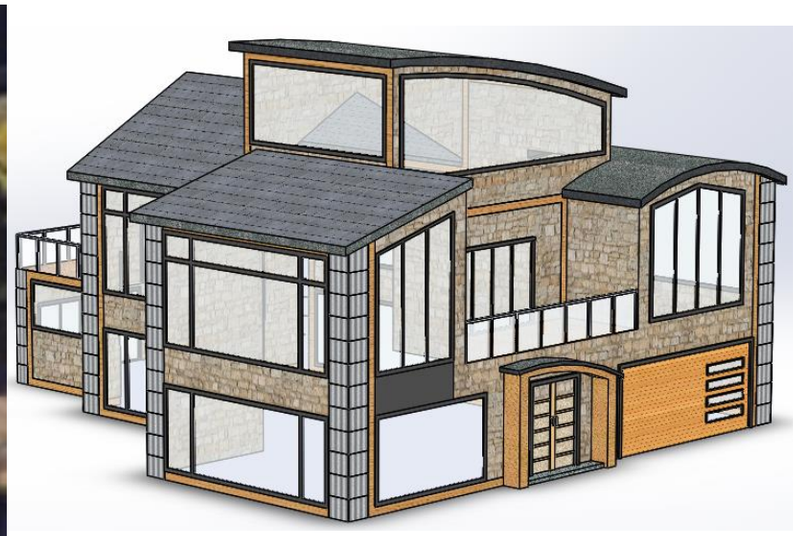
First Floor





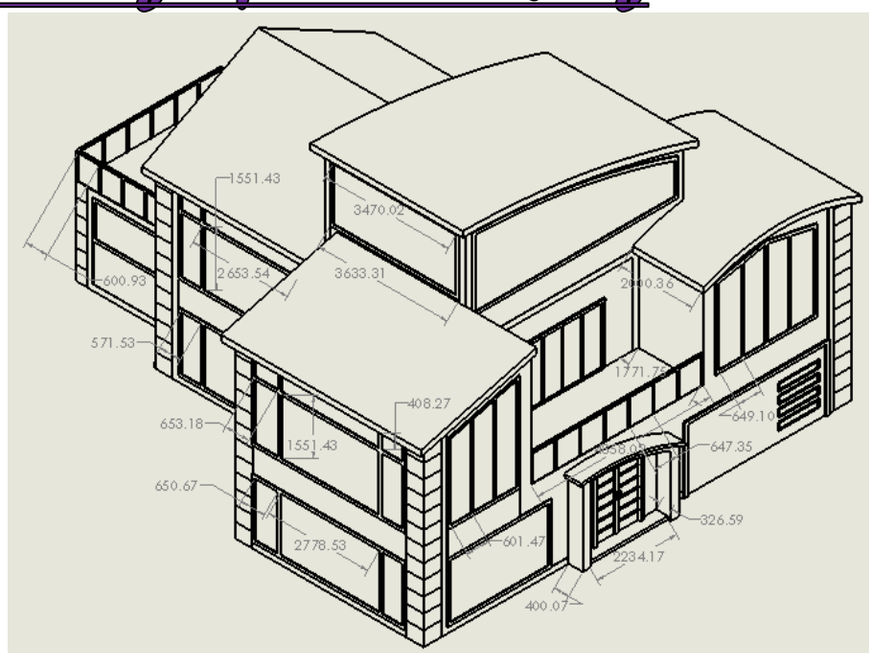
Ground Floor

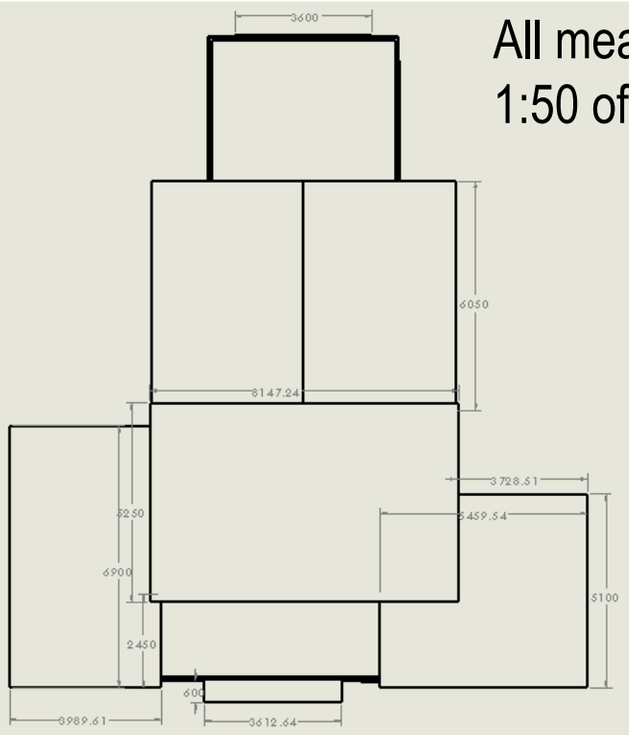


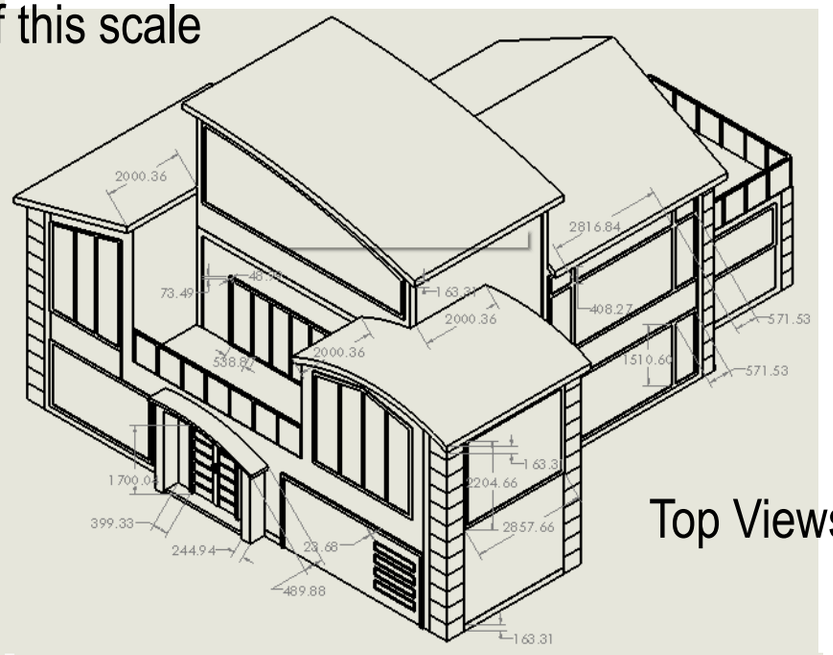


Orthographic Drawing

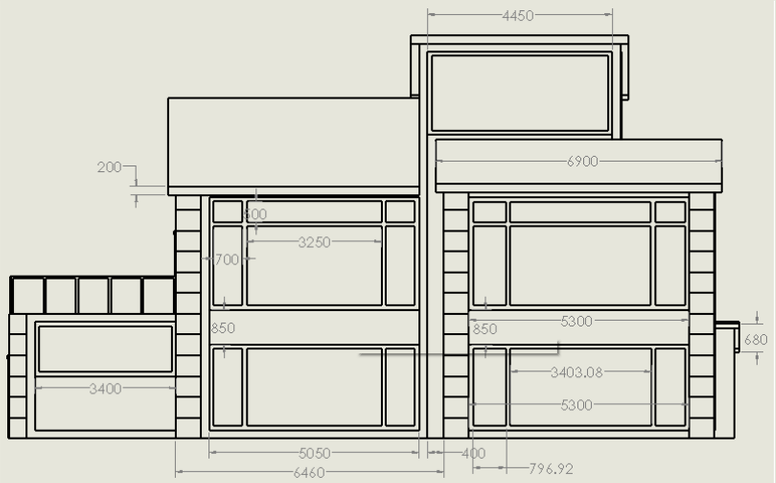
All measurements are in mm, the model will be 1:50 of this scale

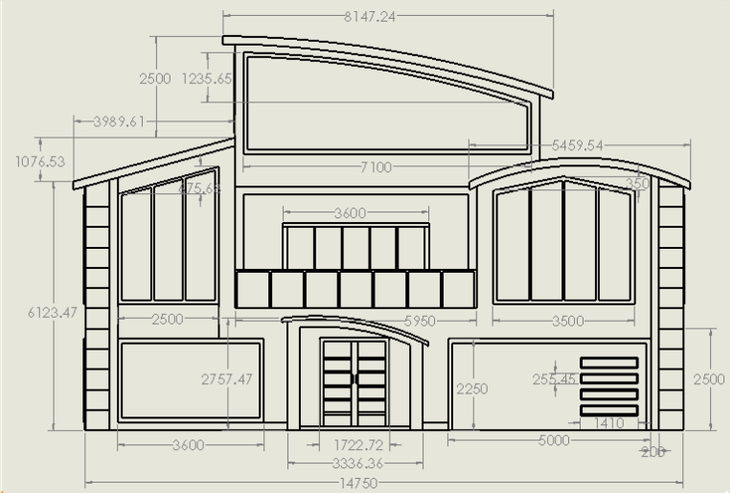


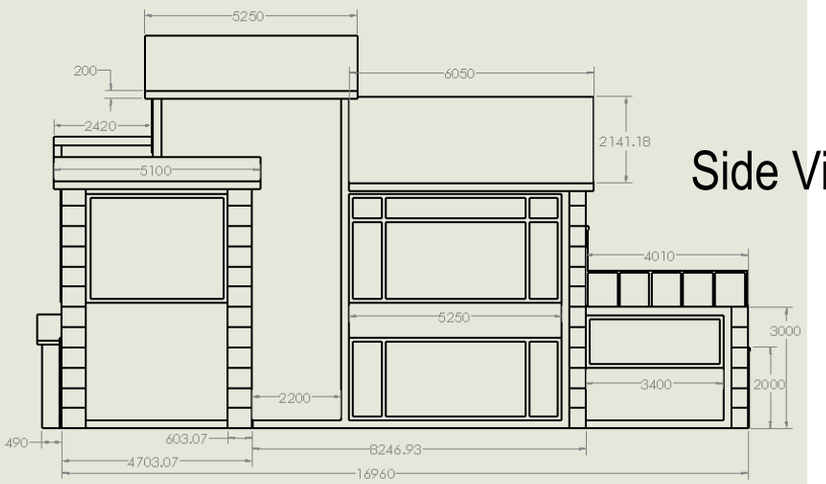




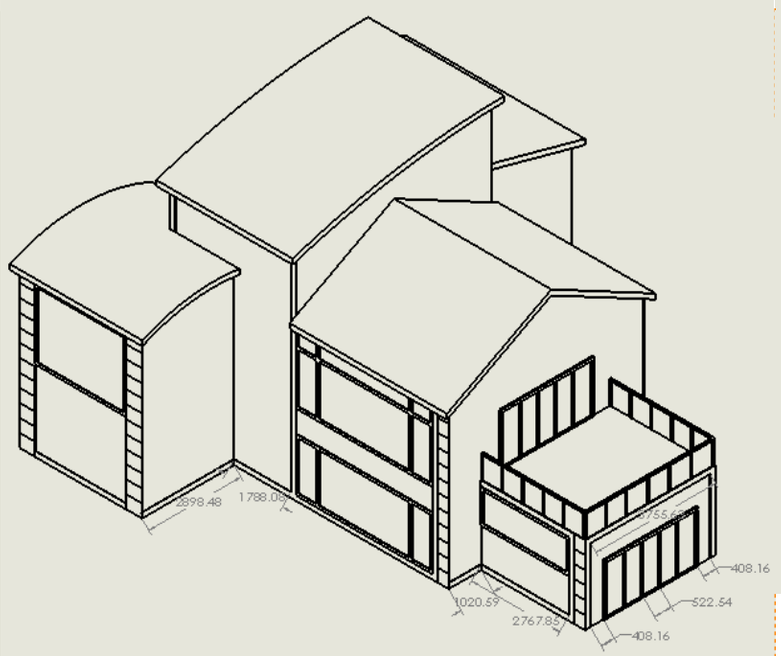
Top Views

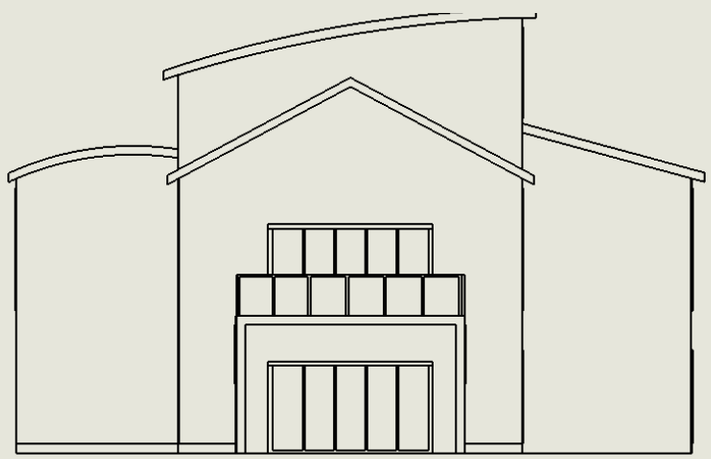


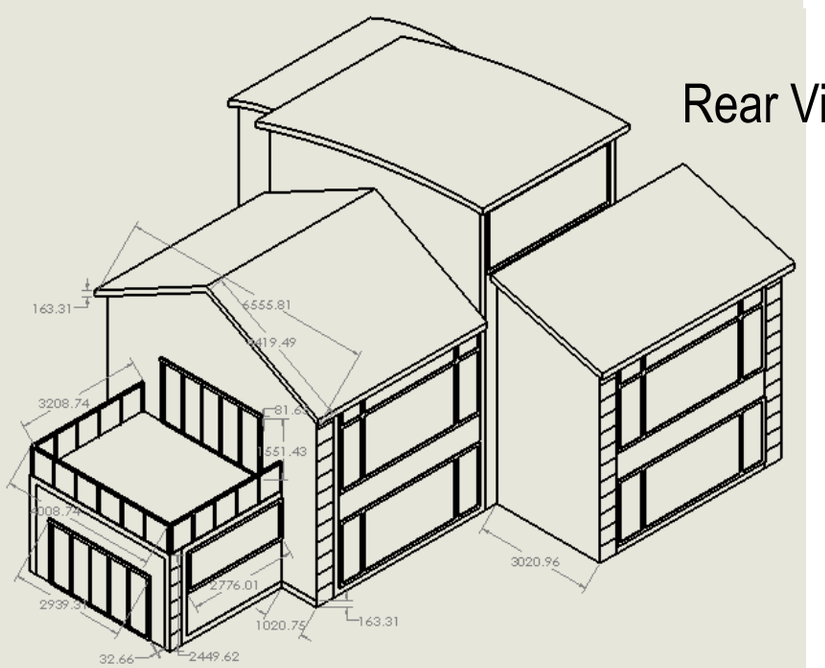




Side Views







Rear Views

Manufacturing Specification (Actual)

Concrete: Will be used for filling in the foundations of the house, to a depth of around 1.5m to give the house a sturdy platform to be built on (and to comply with building regulations). Also to be used to fill in the footings which follow the lines of the load bearing walls to ensure they stay stable also. The foundations need to be as load bearing and as stable as possible.

Cinder Blocks: These blocks are what build up the inner shell of the house, They are what make up the majority thickness of the walls. Need to be light and load bearing at the same time, so they can add strength to the structure without adding too much weight They are very strong (and load bearing since concrete is especially strong when squashed) as well as lightweight due to their aerated nature.

Limestone Bricks: This will be the exterior material / look to the house, the bricks need to be a cream / light orange colour as this is the look that my clients want. If the bricks are reclaimed this will be even better as my clients would like to be as environmentally friendly as possible. The bricks need to also be load bearing, which limestone is.

Oak Cladding: This will be used on top of the limestone bricks to add colour and material variation to the property, purely aesthetical with no function. This oak needs to be a lighter shade, since this is what my clients prefer. Needs to be waterproofed so that it doesn't need to be replaced over time. Also my clients want an interesting texture to the surface to keep the design interesting.

Stainless Steel Cladding: This is another material purely for aesthetics, these cladding panels will run up the corners of the building to add texture and material variation to the house, to keep the design interesting (as per my clients wants). The steel needs to be stainless so the panels don't rust over time and become unsightly. My clients would like the panels to be reflective / shiny also.

Rafters + Joists: These will be used for building the roof structure, the rafters will be assembled in a peak / pitch formation and nailed in place, the joists will be installed between floors giving a support to stand on. Will be made from pine since this is a good load bearing material and will not be seen from inside the building.

Thermoslate / Slate Shingles: These are the roofing materials used for the non- curved roof sections. The Thermoslate will act as a large solar panel disguised as a regular slate roof. Will collect energy for heating water and running electricals in the house. The slate shingles will be nailed around where the Thermoslate cant cover. The two materials need to look identical. The Thermoslate needs to be as efficient as possible and installed on a south facing roof.

Tempered Glass: This type of glass will be used for all windows of the property as well as the glass railings on both balconies because tempered glass is far stronger than regular panes. It will also not shatter into large shards meaning less risk in an accident. The glass needs to be extremely tough over a large surface area, as well as load bearing since a lot of weight will be above it.

Emulsion: This will be used for the interior decoration of the walls, my clients wish to keep the colours light to keep the bright and airy feel inside the house. The emulsion will be used in all rooms of the house and will keep a consistent colour.

Laminate: Will be used to replicate the look of timber floor boards, the laminate flooring will be used throughout the house, in most rooms, since my clients prefer this over carpets. The laminate should look like a darker shade of oak or cedar. The panels must be laid so they are waterproof so moisture doesn't get trapped underneath and cause mould.

Cedar Decking: This will be the exterior flooring material for the two balconies, the decking should be made from cedar as this is the look that my clients prefer. The planks should be laid so that no water can run underneath and cause mould. The planks need to be waterproof so that they do not absorb water and break down.

Insulation: This will be packed in between all walls of the house in order to keep the heat inside the house and prevent heat escape. The material used needs to be inexpensive since a lot of it will be used. The material also needs to be lightweight and be able to trap air inside of it, to prevent the heat loss.

Rubber Membrane: Used for the curved sections of the roofing, because shingles will be difficult to lay on a curved surface due to their flat and brittle nature, the membrane must be waterproof so no moisture leaks into the house and causes further issues. The membrane should be dark grey to match the slate shingles and fit with the colour scheme.

Fibreglass: This will be used for the window frames, the dark grey look should match the colour scheme of the house, they must be this colour so they look classier than PVC frames. The frames must be waterproofed and air tight so that no air / heat escapes from the house.

PVC: The guttering for the house will be made from this, the water collecting from the roof will run into these half pipes and run down into a rain water collection system and be recycled. Guttering must be dark grey in colour so it matches the colour scheme and doesn't look out of place. The PVC must be rigid also. The guttering needs to cover all roof areas to maximise collection. Since my clients want to reduce water bills and be environmentally friendly.

Rainwater Collection System: After the rain water runs down from the guttering it will collect here, the tank needs to be of a large volume (at least 200L) to store as much water as possible. It also needs to contain a filter to remove impurities from the water. Also should be dark grey in colour so my clients don't think it looks unsightly.

Plaster: This will be used to flatten out the walls and create a smooth surface to then apply an emulsion finish. The plaster needs to be applied flat to give a professional look, as well as be wear resistant so it doesn't crumble away over time. The plaster should be fast drying for convenience.

Block Paving: The front driveway will use block paving, since it provides a flat road surface to drive the cars out of the garage onto. My clients would prefer a grey colour, they don't want anything too flashy. The blocks must be stuck down by hardening concrete so the blocks cant be removed over time. The front door step will be block paved also, so must be built to the right height.

Vapour Control Layer: Will be located underneath the rubber membrane / slate shingles on all roofs so that moisture doesn't pass into the roof and cause mould / further issues. Will be combined with Styrofoam insulation to keep heat trapped inside the house. The layer must be lightweight so it doesn't add any extra weight to the roof.

Bifold Doors: These will be the entrances to both balconies as well as the back garden, these should be dark grey in colour to match the look of the window frames, the frame of the doors needs to be not too obstructive and should have 5 large panes. The door should open up as a single door or slide across to fully open up.

Description	Price (£)	Qty	Total (£)
Groundworks			
Plot	1,600,000	1	1,600,000
Site Clearing	0	1	0
Site Surveying	400	1	400
Soil Testing	40	1	40
Total Groundwork Cost			**1,600,440**
Footings			
Footing Trenches	2000 (per 30m³)	3	2,000
Concrete Blocks	0.81 (per bock)	3080	2,945
Concrete Fill	4720 (per 30m³)	1	4,720
Drainage	45 (per 3m)	5	225
Total Footing Cost			**9,890**
Foundations			
Foundations / Excevation	2,000 (per 30m³)	7	14,000
Steel Mesh	200 (per 30m³)	7	1,400
Concrete Fill	4,720 (per 30m³)	7	33,040
Sand	40 (per 16m²)	13	520
Mortar	40 (per 13.5m²)	10	400
Damp Proofing	20 (per 5L)	5	200
Total Foundations Cost			**49,920**
Building Works			
Concrete Blocks	0.81 (per bock)	8600	7,000
Mortar	40 (per 13.5m²)	13	520
Joists	2.50 (per m)	205	513
Waterproofing	230 (per 6m²)	26	5,980
Insulation	10 (per 8m²)	20	200
Limestone Bricks	156 (per m²)	172	26,832
Oak Cladding	35 (per m²)	29	1,015
Stainless Steel Cladding	13 (per m²)	108	1,404
Total Building Works Cost			**43,463**
Roofing			
Rubber Membrane	20 (per m²)	70	1,400
Guttering	12 (per 4m)	22	264
Slate Shingles	150 (25x)	3	450
Stainless Steel Sheets	40 (per m²)	70	2,800
Vapour Control Layer	30 (per 7m²)	10	300
Total Roofing Cost			**7914**
Windows / Glazing			
Tempered Glass (Windows)	35 (per m²)	116	4,061
Tempered Glass (Balcony)	35 (per m²)	12	670
Waterproof Membrane	10 (per 10m)	20	200
Fibreglass Frame	300	15	4,500
Total Window Cost			**9,431**
Electricals			
Electrical System	6,500	1	6,500
Total Electrics Cost			**6,500**
Plumbing			
Plumbing System	15,000.00	1	15,000
Total Plumbing Cost			**15,000**
Central Heating			
Under-floor Heating	4,000	1	4,000
Central Heating System	9,500	1	9,500
Total Central Heating Cost			**13,500**
Internal Finishes			
Staircase	1,500	2	3,000
Plaster	10 (per 10m²)	63	630
Emulsion	25 (per 15m²)	20	500
Skirting	10 (per 3m)	42	420
Damp-proof Membrane	220 (per 40m²)	7	1,540
Laminate Flooring	20 (per m²)	250	5,000
Bathroom Tiles	30 (per m²)	16	480
Total Finishes Cost			**11,300**
External Finishes			
Cedar Decking	70 (per m²)	35	2,450
Balcony Railings	250 (per m)	17	1,750
Total Finishes Cost			**4,200**
Doors			
Internal Doors	350	14	4,900
Front Door	800	1	800
Garage Door	2,600	1	2600
Bifold Doors	3,425	3	10,425
Total Door Cost			**18,725**
Sustainables			
Thermoslate	2000 (per m²)	76	152,000
Rainwater Collection System	570	1	570
Total Sustainables Cost			**152,570**
Landscape			
Block Paving	50 (per m²)	45	2,250
Grass	10 (per m²)	360	3,600
Exterior Patio	50 (per m²)	40	2,000
Cedar Decking	70 (per m²)	50	3,500
Total Landscaping Cost			**11,350**
Labour			
Builder's Labour Costs	35,280	6	**211,680**
Contingency			
Total Contingency estimate	10% of total build cost		**56,589**
Grand Total			**2,222,472**

Manufacturing Specification (Model)

MDF:
MDF sheets will make up the majority of the model, A large 30mm or thicker sheet will be used for the base, giving the model a sturdy foundation. Also used for the main structure of the house, (all the walls) since it is an inexpensive and easy-to-model material. Also used for the front door and garage door (thinner sheets). The flat roof surfaces will also have an under layer of MDF for strength.

Grass:
The modelling grass will cover the majority of the remaining surface area that the house doesn't. There will be a front garden and a back garden that the grass will cover. The grass needs to be a realistic shade of green to represent grass (not too bright / luminescent). The grass needs to be right texture and not too bushy.

Card:
Thick dark grey card (210 gsm or higher) will be used for the flat roof surface, the slate shingles will be laser etched onto the surface with a laser cutter. The card's colour must closely represent the colour of slate.

Green Flock Adhesive:
This will be used in addition to the modelling grass to create the front and rear lawn. The adhesive will bind all the grass together. The adhesive will be spread first then the grass will be sieved on top. The adhesive must be green (not clear, otherwise the underlying MDF can be seen) and must be the same shade of green as the grass.

Adhesive:
This will be used for sticking everything together (Making sure all walls are connected, attaching windows etc.), the adhesive must have a strong and long lasting hold with woods and plastics. Little adhesive must be required for a strong hold, due to the accuracy required and small surfaces.

Glass Paper:
Will be used for the rubber membrane on all of the curved roof surfaces, it will be cut out using a laser cutter for accuracy, the glass paper needs to be very fine and not too coarse, as this will best represent the smooth texture of rubber. The shade of grey needs to match the dark grey card also.

Clear Acrylic Sheet:
Clear acrylic sheets will be cut out using a laser cutter and used as windows, smaller panels will be cut out and used for the tempered glass railings on each balcony. The acrylic must have good optical clarity to best represent windows, and must have some abrasive resistance to avoid scratches on the windows.

Acrylic Paint:
All three acrylic paints will be mixed together in a palette (White, Black and Orange) to create the colour of cream limestone. Along with laser etching the surface into bricks, the look of limestone can be achieved. PVA glue will be used in the mixture to bind the colours together and the paint to the wall.

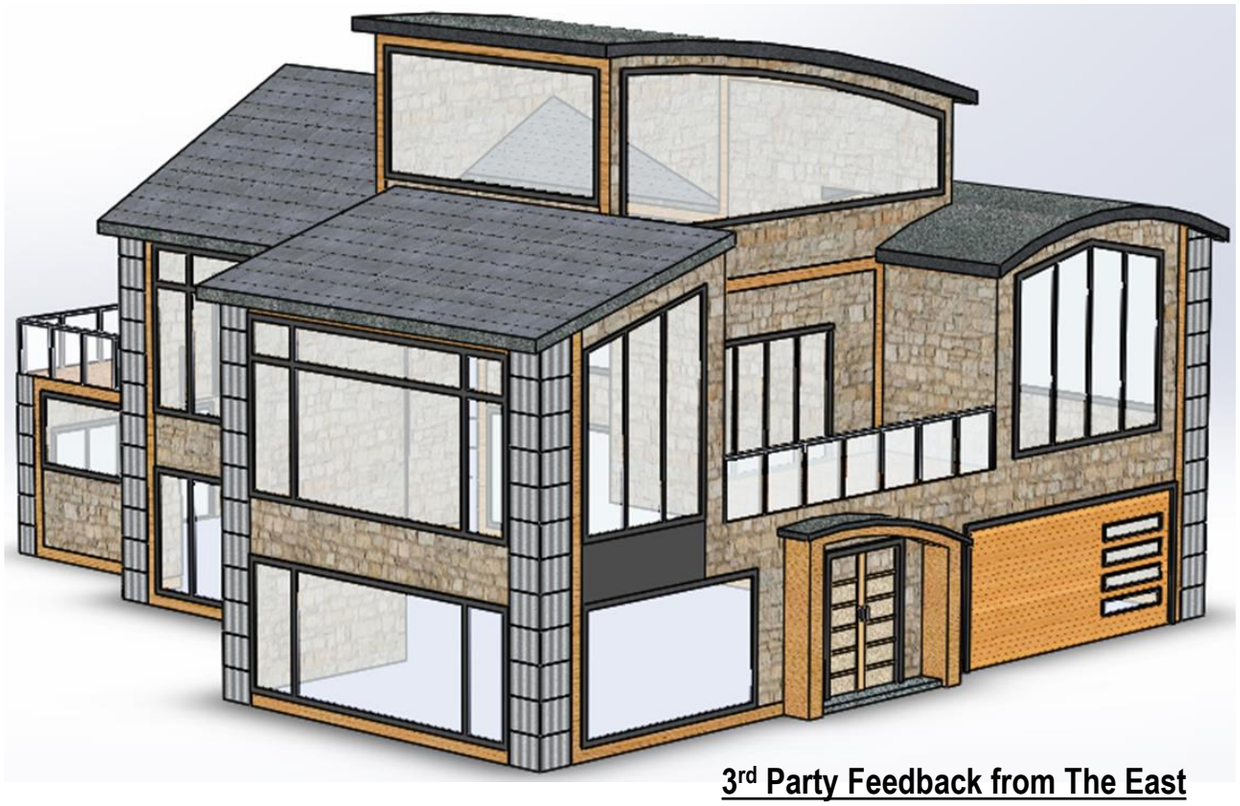
Grey Acrylic Sheets:
Dark grey acrylic will be used for the window frames and light grey acrylic will be for the metal railings. The dark grey acrylic should be a matte colour to represent fibreglass. The light grey acrylic should be shiny to represent shiny metal.

Trees:
In the back garden of the model I will place a few trees for added scenery and to go well with the modelling grass. The trees must look fairly realistic and have moderate detail, since the rest of the model is to look as realistic as possible.

Aluminium Sheet:
The main use will be to run up the corners of the building, acting as the stainless steel cladding, the laser cutter will be used to etch separations in the cladding to give the look of multiple panels. The secondary use will be to bend the metal in the shape of the curved roof. This is the strongest material I could find that bends. The grey glass paper will be glued over the top.

Description	Price (£)	Qty	Total (£)
Modelling Grass	3.15	1	3.15
Green Flock Adhesive	8.8	1	8.8
Modelling Trees (Pack)	1.66	1	1.66
3mm MDF Sheet (pack)	1.79	1	1.79
30mm MDF Sheet	1.5	1	1.5
MDF Sheets (15mm)	1.5	10	15
300gsm A3 Card (10 pack)	4.08	1	2.08
210gsm A3 Grey Card (20 pack)	2.86	1	2.86
Fine Dark Grey Glass Paper	0.5	3	1.5
Aluminium Sheet	10	1	10
Modelling Adhesive	1.84	1	1.84
Light Grey Acrylic Sheet	1.5	1	1.5
Dark Grey Acrylic Sheet	1.5	3	4.5
Clear Acrylic Sheet	1.5	3	4.5
White Acrylic Paint	2	1	2
Black Acrylic Paint	2	1	2
Orange Acrylic Paint	2	1	2
Pva Glue	2.95	1	2.95
Total			69.93

Review of Final Design



3rd Party Feedback from The East Northamptonshire College Students:

Joe: I like the way this design has interest where everywhere you look. There is so much detail; the contours of the home are so modern and unique, whilst keeping a traditional element through the form of the limestone bricks.

Amy: I love how the floor plan gets smaller as it reaches the back of the house. I reminds me of the empire state building. My favourite parts are the balcony; they would be a great space to entertain guests in the summer.

Brandon: The colours of the roof and walls are complimentary. The garage's orange facade is contrasting and eye-catching. I like that shape of the roofs, they will give a grand feel when you stand inside the house. I like that most of the windows look uniform but would like if the bottom left window and top window shared the same style

Client Feedback:

What do you like about this design?	We absolutely love this design, especially how it is in the old meets-new-style. The contemporary and large windows meeting the old limestone and slate roof, meaning plenty of natural light enters the house which suits our style of living. We really like the overall curvy style, the colour palette and the materials used.
How do you feel about this improved shape of the property?	We feel that the design is very unique, it is very unconventional and asymmetrical. We're confident that nobody else will have a house like this and will really make us stand out. We love the roof style will all the curves which allows plenty of shape variation in the house. We are also happy with the shape variation in the windows too.
Does this meet you needs / wants? Would you live in this house?	This house is the perfect size for us, and it will include all the things we need and want, there is plenty of storage space also. The office was an essential working space I needed and this design will allow me to work from home easily. The design is very good for the environment also and we are happy we are doing our part. Overall, we will be very happy living here for many years to come.

Function: The specification has been strongly met here because:

- This development has allowed the house to be a lot larger than before, there is enough room for 5 bedrooms and 5 bathrooms, so that the family can have their own space each. There are plans for an annex to the left of the entrance on the ground floor for the elderly relative staying. My clients are also very happy to live here and feel comfortable with the size.
- The location and plot remains the same despite the design, the rural village of Hale, Manchester is ideal for my clients due to the quiet and relaxed atmosphere. My clients have already approved of this location and are happy to retire there.
- The Thermoslate shingles on the side and rear roofs act as an environmentally friendly aspect of the design and will save on electricity bills all year round without the need to fit large and unsightly solar panels onto the roof. However this design has dropped the rainwater collection system.
- This development has reduced the width of the house slightly and has allowed the shape to become more elongated in order to fit the plot better. Space can be maximised and this allows pathways or extra space round the size of the house. The house will not extend beyond the given plot or have any overhanging structures into any neighbours gardens.
- This development has kept the rear pitch the same, so there is plenty of loft storage space at the back of the house for the family to store their belongings without cluttering the house. The garage on this development is large enough for two cars as well as space for bikes and other tools.

Form: This design has strongly met the specification here because:

- The finished house has a very unique design with many different shapes and curves at the front of the house. The curved roofs allow this property to look much different than any other houses, far from the generic designs my clients are used to. There is also a good variety of materials used on the house surface: Limestone bricks for the main finish, Stainless steel cladding on the corners replacing the corner windows as well as oak cladding and cedar decking.
- This development has introduced larger and many more rectangular windows around the property, which will allow much more natural light to enter the property creating the light and airy atmosphere my clients crave. The windows are now so much more open and less obstructed by partings. The front feature windows give great variety to window shape also.
- This design allows a greater variety of colours and textures. From the timber texture of the cladding, decking and garage, to the limestone brick texture surrounding the property. A shiny texture is created by the stainless steel cladding as well as a matte texture to the roofing with the rubber membrane texture to the curves. Limestone doesn't take over the colour palette.
- This design includes all natural colours and textures, apart from the stainless steel, however this isn't too strange to the average observer. No unnatural colours or renders are used on this property, so it should fit in well with other houses.
- My clients now wish to have fibreglass window frames, I have met their needs by including It in this development, including the bifolding doors being made of the same material. They give a visually appealing black outline to the windows.

User Requirements: My clients needs have been met here because:

- There are plans for 5 bedrooms and 5 bathrooms around the house, each with en-suites apart form a downstairs bathroom. Each will be the suitable size for luxury and be in the correct places for convenience. This will cater for the family's need for their own spaces.
- There are still plans for an annex to the left of the entrance on the ground floor for the elderly relative staying. The area will include a bedroom with en-suite, a small kitchen area, plenty of storage space and suitable living space. This should meet the requirements of my clients elderly relative.
- There are still plans to install an underfloor heating dry system beneath laminate flooring around the house. To keep the house warm in the winter and provide continuous comfort for my clients.
- Three bifold doors can be seen on this development, there is one at the front opening up onto the enclosed porch area. There is also a bifold door acting as a back door, which opens up the kitchen to the rear decking, great for hosting guests in the summer. There is another bifold door opening up from the living room onto the rear balcony.
- This development has added a double garage at the front of the house, large enough to fit in both cars as well as bikes / tools.

Performance Requirements / Safety: This design has met the specification well here because:

- In my client comments, my clients have said that they will be very happy to live in this house, they see it as a massive improvement to their current house. Ultimately upgrading their lifestyle and luxury and providing a large space for the family, any extended family visitors and providing a relaxing place to retire.
- This house takes into account the anthropometric measurements of the human body. All elements of the house are the correct dimensions.
- Relatively easy access for the elderly relative, there is only a single step into the doorway and the annex is located just to the left of the entrance.
- The house foundations will be constructed properly and will take into account the building regulations for a larger property.

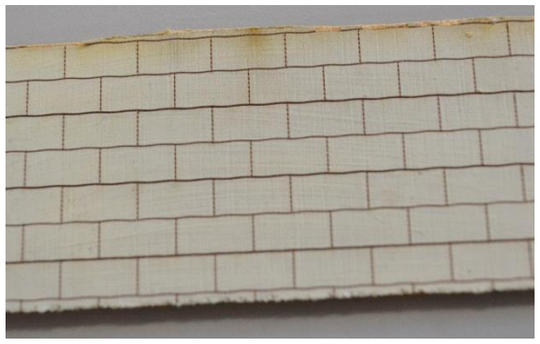
Material & Component Requirements / Sustainability: Requirements have been mostly met here because:

- The vast majority of materials this house will be made from are re-usable or sustainable. The limestone bricks will be reclaimed and used rather than purchasing new materials and wasting resources. The oak used for the cladding will be sourced from FSC approved sources. The slate shingles will also be reclaimed, wherever there isn't Thermoslate installed.
- All materials will be sourced from reliable places and will be constructed properly to increase house durability.
- This design has dropped the idea of a rainwater collection system, spec not met here.
- When constructed, this house will have the correct amount of cavity wall and roof insulation to trap as much heat in the house as possible in the winter. The foundations will be made from steel reinforced concrete, to reduce the amount of pure concrete used.

Scale of Manufacture & Cost: This design has met the specification here as well because:

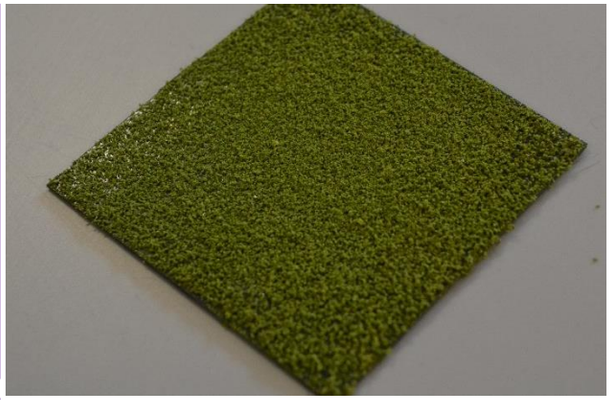
- This project is definitely a one-off, there are no plans for this design to be repeated elsewhere as this design is specifically aimed at my client's needs, wants and values. Others may not have the same requirements.
- This house does fit into my clients budget of £2,250,000. The estimated overall cost of manufacture should be £2,222,472, this makes more than enough room for contingency as well as any extra internal finishes my clients decide to have. The most inexpensive materials have been chosen whilst keeping the quality needed for the design.

Model Testing



Limestone Bricks:

How it was made: I took a 3mm sheet of MDF, and cut out a small rectangle using a Tennon saw (guided by pencil measurements and ruled lines), later sanding the edges with the belt sander. The top surface was painted with a mixture of Acrylic paints, (Blue, White & Back) to create the Limestone surface colour. Whilst drying I used 2D design to create the brick pattern and then etched it out of the surface using the laser cutter.
What could be improved: I am not completely satisfied with the colour of the bricks, I'd like a more yellow / cream colour to more accurately represent the real life look. On the final model I will also decrease the scale of the bricks.
Where on the model?: It will be used for the majority of the exterior surface (the limestone brick exterior), where to cladding and windows aren't. Giving the main colour of limestone.



Grass:

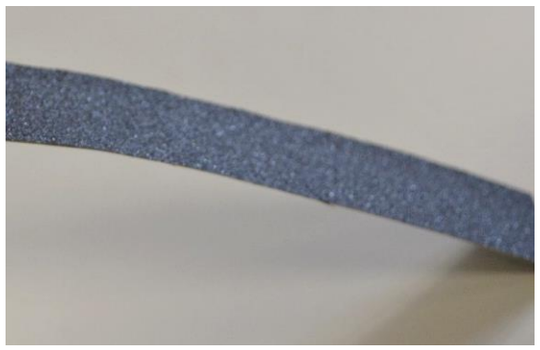
How it was made: I took a 3mm sheet of MDF, cut out a small rectangle using a scroll saw. I painted green flock adhesive onto the MDF surface (this gives the look of the green underneath but is also an adhesive). Whilst still wet, I sieved some faux modelling grass over the top, then left to dry.
What could be improved: I think the grass layer looks a little thin and in some parts you can see the MDF underneath. In the real model I will make sure to glue on a thicker layer of grass, sieving out the grass also to ensure an even layer. I am happy with the grass colour however. I would also like to find a roll of grass to allow the process to be faster and simpler.
Where on the model?: The grass will surround the model in the front and rear garden, to give a sense of location and context to the building.

Thermoslate Shingle Roofing:

How it was made: I cut out a small rectangle out of a sheet of 1mm black card using a band saw. I used 2D design to create the shingle pattern, then I put the card in the laser cutter and etched the design onto the card. The card was self finished and I didn't need to edit the surface texture. Each tile will be to scale and look accurate and realistic in the final model.
What could be improved: I am overall very happy with the look of this texture, in the final model I will decrease the scale of the shingles to be similar to the bricks. I will need to make sure the curved roof colour matches the shingles.
Where on the model?: The pitched roof behind the top curved roof will have the thermoslate shingles, also the flat slanted roof on the left side will utilise the thermoslate.

Stainless Steel Cladding:

How it was made: Using the same method as the curved roofing, I cut out a thin rectangle from a 1mm sheet of aluminium using a band saw. I used 2D design to create a separation pattern and used the laser cutter to etch separations in the surface to give the look of multiple cladding panels. The aluminium had a self finished surface and I didn't need to change the look.
What could be improved: The laser cutter didn't etch deep enough into the metal so in the model I will make sure the separations are more prominent and uniform, unlike here. The surface I feel is a little too shiny, a less shiny surface would be preferred on the final model.
Where on the model?: The majority of corners of the building will have these panels running up the surface

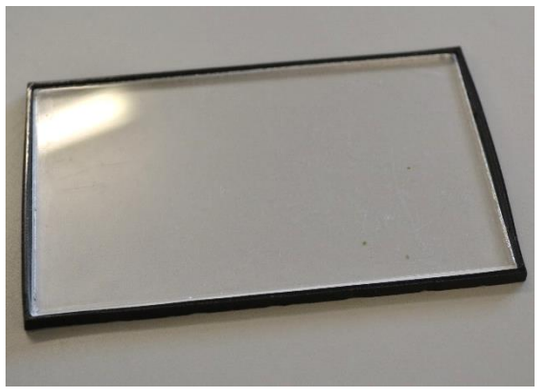


Curved Roofing (Rubber Membrane):

How it was made: I acquired a 1mm sheet of aluminium, I cut the rectangle out using a band saw, using measurements and markings from a metal ruler and scribe. I cut of the jagged edges with a craft knife. Using the same dimensions, I cut out a rectangle out of a sheet of dark grey glass paper. I used double sided tape to stick the glass paper to the surface.
What could be improved: I'm not satisfied with the texture of the glass paper surface, to make it look more like a rubber membrane I would like to use a finer grade paper but keep the same colour. I should find a substitute material for the under layer, since the roof is too thin and may be too heavy.
Where on the model?: The curved roofs at the front will all use this method. If connected properly the thin sheet of aluminium should be able to hold the roofs up well.

Garage Door and Cladding:

How it was made: I took a 2mm sheet of veneer and cut a small rectangle out using a craft knife. I also cut out two other thinner rectangles out of veneer . I went on 2D design and made the pattern for the veneer. Then etched it on using the laser cutter (this ensured the lines were uniform and perfectly straight).
What could be improved: In the real model there will be window separations in the garage door, this sample was meant to represent the cedar colour and texture as well as the light oak cladding around the outside, so the windows aren't present here. I will also decrease the thickness of the etching and distance between etches in the future. The materials by themselves are far too thin and weak, to improve I will need to have a sheet of MDF behind it for support
Where on the model?: This will only appear once on the model, at the front of the house this will be the double garage door on the right side.



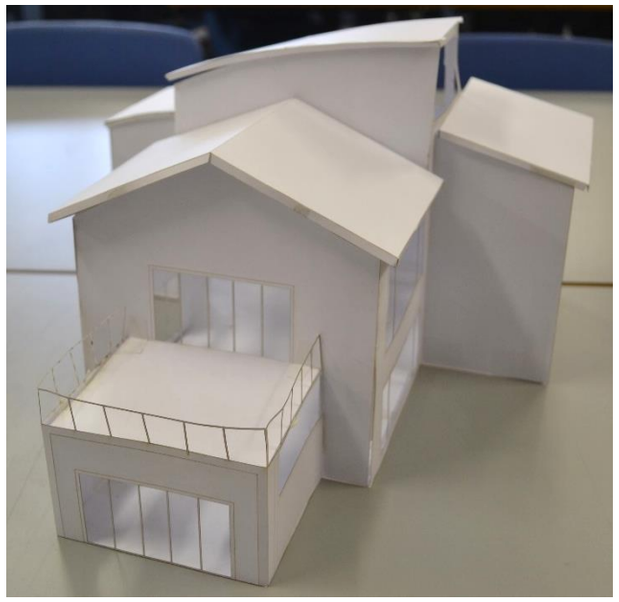
Large Window (Fibreglass Framed):

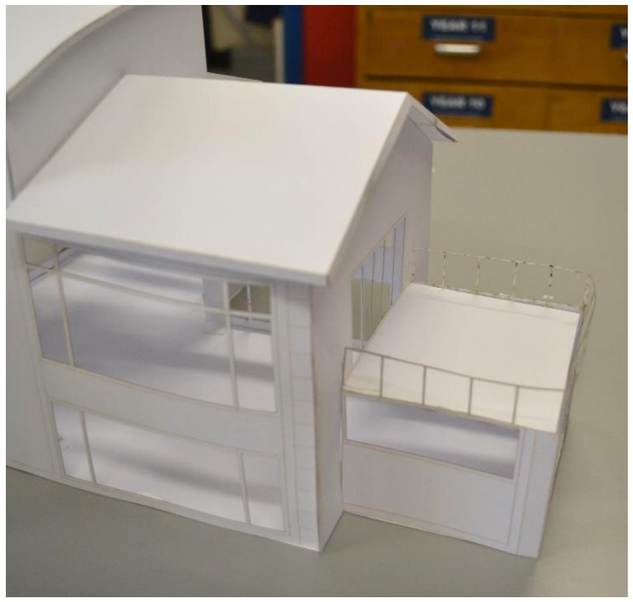
How it was made: I took two sheets of Acrylic plastic, a clear and a black one. I went on 2D design and designed a rectangular frame, sent it to the laser cutter and cut out the frame using the black acrylic, I then used the same dimensions to create a rectangle for the clear acrylic, cut that out also with the laser cutter and slotted the clear rectangle inside the frame without the need for adhesive.
What could be improved: The window frame colour isn't the one I want yet, I would like to use a dark grey matte texture plastic to best represent the look of Fibreglass frames.
Where on the model?: All of the windows around the house will use this method, regardless of the shape, since the laser can cut all shapes accurately. Will also be used for the bifolding doors, as they will have the same glass and framing in reality.

Specification Analysis:

Aesthetics: The samples here meet the requirements for aesthetics because they are all very representative of the real materials. A few sample's looks need to be improved slightly however. The colours work well together, there are no outrageous colours and the colour theme will fit in with other houses in the area well. There is a good variety of colour and texture around the house as well.
Size: The specification is not met for size, because the samples are not to scale, only to show aesthetic appearance. The model will have the correct scale meaning size adjustments will need to be made to these samples.
Performance Requirements: All materials hare are very durable apart from the garage door, the specification is almost met here. The garage door will need to have a sheet of MDF behind it for support. The etching should be less deep to keep some rigidity to the veneer.
Sustainability: Spec is met here because all the materials here can be recycled, some of the boards are biodegradable also (e.g MDF). However materials might not be re-used since most finishes have etching.

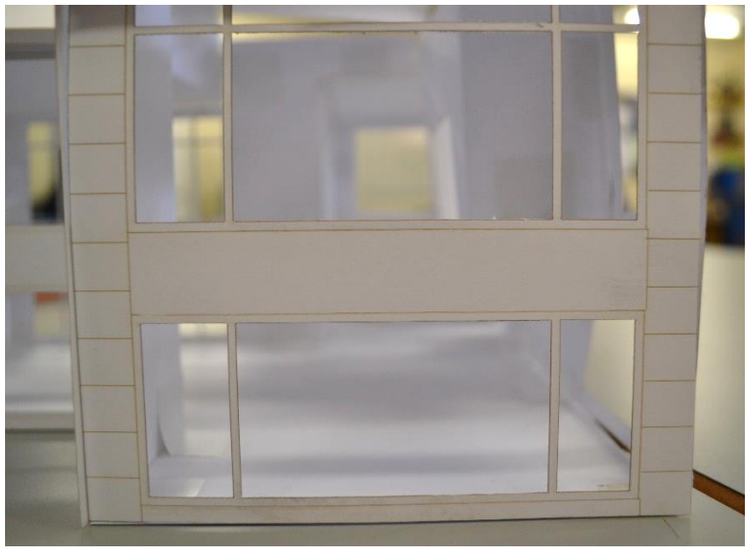
Card Block Model





Client Review:

We are very pleased with how the mock model has turned out. The model gives us a great visual representation of what the final shape of the house will look like, and we are still really happy with it. There is a lot of light able to enter the house, which is giving the light and airy atmosphere we wished for. Apart from the roof imperfections, we wouldn't change the design at all as it is exactly what we need. We look forward to seeing further developments.



Process: Once the house design was finalised on CAD, I created a mock- up architectural card model so that I could gain a visual idea of what the design would look like in person, also so that I could know if the design works structurally or not. By making this model I can see if all my measurements are correct or not and if I need to make any design adjustments for when I make the model out of MDF. I want the real model to be as accurate and precise as possible.

Firstly, I needed to recreate all of my external house faces on 2D design, (I took all measurements from my SolidWorks design as well as my orthographic projection). Since my model was a 1:50 scale, I then divided these measurements all by 50 and drew everything out. I then sent these designs to a laser cutter where it would cut and engrave the shapes I needed onto thick white card. The card was chosen since it is recyclable, inexpensive and widely available, so we had plenty of it to work with. Card is also more structurally stable compared to just paper, meaning a stronger structure.

I created a base and built upwards, I stuck the vertical wall faces to the base (and to each other) using double sided tape for added strength. I often created nets for more complex shapes so they were easier to construct, e.g the front porch, the top balcony indent and the roof pieces.

I experienced a small issue with the front top window, with the measurement s being slightly too long, so in the final model this will be fixed to make it flush to the side wall. Every other measurement worked to I am now ready to build the MDF model.

Specification Analysis of Model:

Form: Spec met here as the design has kept its size and will be suitable for a large family and still be spacious enough for 5 bedrooms and bathrooms. The design is still an elongated shape and is still longer than it is wide (meaning it will still be able to fit the shape of the plot. The pitched roof is still located at the back of the house meaning plenty of loft storage space for the family.

Function: Specification clearly met here since the design is still unique and unconventional with the curved roofs as well as the front and rear balconies. Many large square and rectangular windows can be seen around the design (of various sizes) as well as some unique curved windows too. Plenty of natural light can enter the house as seen by looking at the inside of this model, there is no need to internal lighting during the day. The double garage door is still in place so there will be storage for both cars inside the house as well as room for other storage.

User Requirements: There are three large bifolding doors on this design still, two at the back (one acting as the back door and one on the rear balcony) as well as one on the front balcony

Performance Requirements: Specification has been met here as the house's front door is easy to reach for elderly people and isn't accessed by climbing a set of stairs. Meaning all members of the family are able to enter the house with ease and there are no issues. During the scale reduction all measurements have kept in proportion meaning all the anthropometric measurements taken during the design process are still there and all features are to the correct size.

Initial Production Plan (3D Model):

This production plan will give me a better idea on how to manage my time throughout the production of the model. So that I can stay on track, know what I should be doing before every lesson starts and not wasting time. None of these steps should take more than two weeks, so I should be able to judge if I am working at the right pace each week.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Fixing dimensions on 2D Design												
Laser cutting house parts												
Painting House Faces												
Laser cutting wall and roof textures												
Laser Cutting and gluing Cladding												
Laser cutting and gluing windows												
Connecting House Faces												
Creating gravel path / laying turf (preparing baseboard)												
Laser cutting and gluing balcony barriers and front porch												
Creating curved roofs / Guttering												

3D Production Flow Chart:

Start

Firstly, take the existing 2D designs for each face and reduce the sizes by 2mm to account for the thickness of the MDF sheets and glue them together.

Has every house piece been reduced by 2mm and is the correct size?

Take some sheets of MDF and laser cut out the 2D designs, including the floor plan.

Then use masking tape to construct the house to make sure every piece pits together perfectly before making any more adjustments.

Do all the house faces connect properly without any gaps?

Take some acrylic paints and mix together some yellow, cream and orange to create the look of limestone bricks. Using images for reference.

Does the paint mix resemble the colour of limestone?

Take some masking tape, tape down any areas that wont be brick, then use a paint roller to spread the paint evenly over the MDF surface. Leave to dry.

Is the paint coated evenly, are you able to see the MDF beneath the paint?

Then go back onto 2D design and create the brickwork design, make sure to copy it onto any wall surface on existing designs so you can then laser cut the bricks onto your pieces.

Do all the house faces have a realistic limestone brick texture?

Go back into 2D Design and make the window frame pieces using the shape of the window outlines. Then make the inside window pane pieces.

Then, take a sheet of Black acrylic and laser cut the window frames. Also take a sheet of clear acrylic and laser cut the window panes.

Do the window frames fit perfectly around the windows? Do the window panes sit flush inside the frames?

Now take all the window panes and frames, use a craft knife and double sides tape to secure each window pane to its respective frame.

Now you can fit each window inside the laser-cut house faces. No gluing required as they should just fit in.

Do all the windows fit in their respective places?

Go back to 2D design to design the oak cladding around the house, using the dimensions from your previous designs.

Take some 1mm thick oak veneer and laser cut out your design. Then use UHU adhesive to stick the cladding to each house face.

Is the cladding the right shape and size? Is it the right colour / texture?

Go back to 2D design and design the stainless steel cladding pieces. Using the dimensions from your previous designs.

Take some shiny silver card, and laser cut out the cladding. Then use UHU adhesive to glue the cladding onto the house faces.

Are the cladding pieces secure?

Now take a large sheet of MDF and use a scroll saw to cut out a suitably sized baseboard for the house and garden.

Use a pencil to mark out areas of garden, areas of path and the house floor plan location. Then take some modelling gravel and some dark grey acrylic paint.

Use masking tape to cover any areas that aren't pathway. Then paint the pathway with the paint (quickly) then sprinkle gravel over the surface. Leave to dry.

Is the gravel secure? Is it sprinkled evenly?

Take a roll of model grass and cut to shape using a craft knife or scissors. Then use a spray glue on the rear side and stick it around areas of garden.

Is the grass evenly laid out and secure?

Laser cut your 2D designs of the balcony decking onto both an MDF sheet and a cedar veneer. For both front and rear decking. Use modelling adhesive to laminate them together.

Are all the faces at right angles to the floor and no gaps in-between?

Gather all your house faces and floor plan, take some modelling adhesive and glue each face together and to the base. Constructing the house the same way as with the card model.

Is the decking secure and does it look realistic?

Now take some modelling adhesive and glue the veneer to the MDF, then glue the decking to its position at the back of the floor plan.

You must now go back to 2D design and create the rear decking shape, take a piece of 2mm MDF and some cedar veneer, and laser cut the design onto both.

3D Production Flow Chart:

Are the balcony decking pieces the correct size and look realistic?

Now take a sheet of grey Extruded Acrylic, laser cut out your balcony railings. Use modelling adhesive to glue in the window panes and stick down to the decking.

Now secure the balcony decking to the house, using modelling adhesive on the railings to the side walls as well.

Are both balconies secure and complete?

Go back to 2D design and design all three pitched roof pieces. Now take a slightly thicker 5mm sheet of MDF and laser cut the designs out, using previously made dimensions.

Now use a belt sander to sand the edges of each piece so they meet in a peak, and so the third piece meets the side wall at the correct angle.

Do the roof pieces sit at the correct angles? Do they look to scale?

Go onto 2D design and create the roof tile pattern, then laser cut it out onto a sheet of dark grey card. Use double sided tape to stick the texture to the roof pieces.

Are the tiles secure and look accurate / realistic?

Go back to 2D design and laser cut the front porch pieces out of 2mm MDF, repeat the process using an oak veneer to texture the surface. Laminate each piece with veneer using UHU adhesive.

Is the porch structure secure and has a good finish?

Use your curved roof 2D design file from your paper model, take 5 sheets of black card and a sheet of dark grey fine glass paper, use a spray mount glue to laminate all layers together.

Are all layers secure and don't come apart?

Use a craft knife and a steel rule to cut out the shape of the roof neatly, using the dimensions of your 2D designs.

Are the roof pieces the correct dimensions and thickness?

Now use modelling adhesive to glue the card into place and maintain the curve on the card. Repeat the process for the front porch roof.

Are the roof secured with no gaps?

Go back to 2D design to laser cut the front porch step out of 2mm MDF, cut out twice and laminate both together with modelling adhesive.

Does the step fit into position and is the correct size?

Take some grey acrylic paint and paint the top and side faces of the slab with a small fine brush.

Does the front step look realistic?

Next, take 6 rectangular dowels of width 10mm by height 10mm and a sheet of HIPS. Take these over to a vacuum former.

Is the dowel the correct size, is the sheet of HIPS suitable for vacuum forming?

Place the dowels and the sheet of HIPS into the vacuum former, heat the plastic and raise the table to cover the dowels with the High Impact Polystyrene

Have the gutters been vacuum formed properly, are they the correct shape?

Take a craft knife and a craft mat, use a steel rule to measure the lengths needed and cut the gutters to the correct length.

Have the gutters been vacuum formed properly, are they the correct shape?

Use a modelling adhesive to secure the gutters in place adjacent to any down-sloping roof.

Do the gutters look realistic and are in the correct place?

Finally, add any miscellaneous items such as model cars etc. For added decoration.

Finish

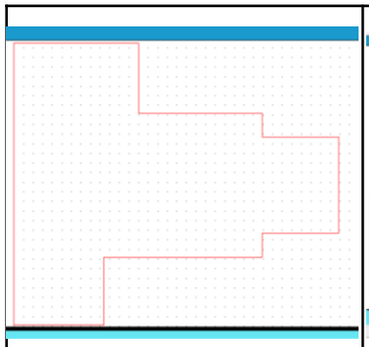
Detailed Project Schedule (3D Model):

Time	6 Hours	3 Hours	2 Hours	8 Hours	6 Hours	8 Hours
Activity	**Fixing Dimensions on 2D Design:** Before any making can start, every 2D design file from my card model is wrong. To account for the 2mm thickness of the MDF compared to the paper, all of the house faces must be corrected. This will be done by increasing the width of a certain side by 2mm and decreasing a different side by 2mm. This can be quite difficult and time consuming but essential to ensure all pieces fit together perfectly and no sanding is required.	**Laser Cutting House Parts:** Once every piece is correctly sized on 2D design, Each house face must be laser cut out of 2mm MDF sheets. Next, the rooftop decking should be laser cut and lines should be etched (to scale) to represent the look of planks. The pitched roof pieces will then be laser cut using 5mm MDF sheets, then the roof pitch angle will be calculated and each piece will be belt sanded so that each roof connects properly.	**Painting House Faces:** Use masking tape to tape down any areas on the pieces which you don't wish to paint over. Use a craft knife and a ruler to get straight corners with the tape. Place pieces on a large newspaper / scrap paper. Take a plastic tray, some white, black, yellow and orange acrylic paint. Mix all colours together in the tray until you get the right limestone / sandstone colour. Use a paint roller to roll the paint over all the pieces until an even coat is achieved. Then take a smaller brush and paint the edges of each piece in the same colour. Then allow pieces to dry.	**Laser Cutting Wall and Roof Textures:** Go onto 2D design and create a brickwork texture, then create a copy of every design file and add the brickwork texture where necessary. Then send an outline of each piece to the laser cutter, and cut it out of paper (this creates a template for the MDF pieces). Then place your painted pieces into the template created and laser etch the brickwork onto all pieces. Rub off any excess laser scorches with your finger gently.	**Laser Cutting and gluing Cladding:** Open up 2D design and create all the cladding pieces of the house (with help form the template of previous designs). This includes the oak cladding as well as the stainless steel corner cladding. Send the designs to the laser cutter and cut the pieces out of their respective materials. Use thin oak coloured veneer and shiny silver card. Use masking tape to remove the small veneer pieces without snapping them. Use modelling adhesive to glue all cladding and leave to dry.	**Laser cutting and gluing windows:** Go back onto 2D Design and create the outlines for every window frame and its respective window pane. Take a sheet of clear acrylic and laser cut all window panes (don't remove the protective covering to avoid scorch burns / melting). Take a sheet of dark grey acrylic and laser cut all window frames. Take a craft knife, craft mat and double sided tape to cut the tape and stick window frames and panes together.
Tools & Equipment	A laptop with 2D Design installed, a computer mouse, a suitable work desk, laptop charger.	Laser cutter, 2mm MDF sheets, 5mm MDF sheet, belt sander, ruler	White, Black, Yellow & Orange acrylic paints, paint roller, large plastic tray, masking tape, craft knife, ruler scrap paper / newspaper.	Laser cutter, a laptop with 2D Design installed, laptop charger, a suitable work desk.	Laptop with 2D design, Laptop charger, laser cutter, Modelling adhesive, sheets of 1mm oak veneer, A4 shiny silver card	Laptop with 2D design, Laptop charger, laser cutter, craft knife, craft mat, double sided tape, clear and dark grey acrylic sheets.
Health & Safety	• Don't use 2D design for extended periods of time to reduce strain on the eyes (use for 2 hours maximum). • Make sure you are seated comfortably to reduce strain on the neck and back. • Take frequent breaks to reduce repeated strain on fingers. • Keep the room well lit to reduce effect of eye strain on the screen.	• When using the laser cutter, make sure to turn on the extractor fan before cutting to make sure no fumes escape into the room and cause harm. • Keep the laser cutter door closed so there is no risk of burning yourself on the laser. • Make sure to wear eye protection when belt sanding • Keep fingers a safe distance form the belt sander. • Keep material flat when belt sanding so it doesn't fly off and hurt someone	• Make sure to wear an apron to protect your clothes form paint stains. • Use the craft knife responsibly and make sure to cut away from your fingers to ensure no injuries. • Do not expose the knife blade when walking or passing it to others, to prevent serious accidents. • Keep the room ventilated to prevent paint fume build-up.	• Do not stare directly into the laser when cutting, as this can hurt your eyes over a long time. • Keep the extractor fan on at all times when cutting so that fumes don't build up in the room, keep fan on at least 2 minutes after each cut. • Keep laser cutter lid closed at all times when cutting and keep the room well ventilated.	• When using modelling adhesive be careful, don't glue fingers together as it has a very strong hold instantly. • Keep the laser extractor fan on at all times and keep the room well ventilated to prevent fume build-up. • Don't stare directly at the laser as it could damage your eyes over time. • Don't look directly at the laser beam as this could cause retinal damage.	• Use the craft knife responsibly, cut away from your hands and put the blade away when carrying / not using it, to avoid unnecessary risk. • Keep the lid of the laser closed as well as the extractor fan on at all times when cutting, to avoid fume build-up in the room, allow extraction cycle to complete before opening the lid.
Quality Control	• I will check that every piece is corrected by using the measuring tool in 2D design to check that the dimensions are correct. • I will also visually check the piece lengths against my paper model in case if I forget which pieces have been corrected.	• Visual check each piece after it has been laser cut, to see if the laser has cut each piece successfully. • Use a ruler to check if the dimensions of the pieces are what they should be. • Use masking tape to build up the model as previously with the paper model, to check if all pieces fit together perfectly before adding textures.	• As you are painting each piece with the roller, make sure every area is covered and the coat looks even. • Visually check each side to check if everything has been painted (including inside the windows). • Visually check dried pieces and repeat the painting process if the coat is too thin.	• Visually check each piece to see if the etching is noticeable enough, each piece hasn't been scorched / burnt. • Use a ruler to see if the brickwork is to the scale you wanted. • Compare each piece to the SolidWorks render to see if every area needed is etched and nothing is missed out.	• Examine each cladding piece after being glued to check the glue hasn't leaked out each side, clean up with a tissue. • Visually check that the cladding is level before the glue sets. • When engraving the corner cladding, visually check to see if the etching is prominent enough.	• Visually check each laser cut piece as it leaves the laser cutter, to check for any melting / scorching of the plastic • Visually check each window frame is the same size and shape as its respective frame. • Check if each window frame fits into the hole cut out for it

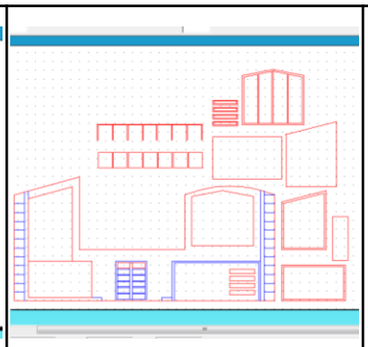
Detailed Project Schedule (3D Model):

Time	4 Hours	4 Hours	8 Hours	6 Hours	3 Hours
Activity	**Laser Cutting and Gluing Balcony Barriers:** Go onto 2D Design and find the files for the front and rear balcony. Create the barrier window panes also. Take a sheet of light grey acrylic, then laser cut the balcony barriers. Take your sheet of clear acrylic and laser cut the window panes next. Laser cut the balcony designs out of 3mm MDF then out of Cedar veneer, use etching on the veneer to give the plank texture. Then double sided tape each veneer to its respective MDF. Take some modelling adhesive and glue the panes into the balcony barriers, leave this for an hour to set properly. Then use the modelling adhesive to secure the railings to the decking and surrounding walls. Leave this to set	**Constructing Front Porch:** Take your 2D designs of the front porch and laser cut them out of 2mm MDF. Use double sided tape to laminate each of the smaller MDF pieces together, the use a fine glass paper to touch up the edges of the structure. Laser cut the same designs out of oak veneer for the front and side faces, secure these with modelling adhesive to give the finishing texture. Create front step by going onto 2D design and designing the front step into the house, next laser cut out the design twice from 2mm MDF. Laminate both together using double sided tape. Next, take some light grey acrylic paint and paint the top and front side of the step. Then laser cut a block paving texture onto the surface to provide the realistic finish.	**Preparing Baseboard / surroundings:** Take a large sheet of 25mm MDF and make out the ideal dimensions with a pencil and steel rule. Take into account size of the house as well as garden surroundings. Take the MDF to a Band Saw and cut the MDF to the correct dimensions, then sand the rough edges with a small piece of coarse glass paper. Mark out the location and shape of the house using the floor plan piece, using a pencil and steel rule. Then mark out the pathway pound the perimeter of the house. Take some black and white acrylic paint, mix a dark grey colour and take a bag of modelling gravel. Use masking tape and a craft knife to remove all other areas other than the pathway. Quickly paint the pathway using a large brush and then sprinkle the modelling gravel over the paint before the paint dries. Leave to dry. Remove the tape and shake away loose gravel. Next take a roll of modelling turf and cut out the remaining area using a craft knife and steel rule, if it helps, use tracing paper to guarantee the correct shape. Then use spray glue to secure the turf.	**Gluing / Connecting House Pieces:** Take a tube of modelling adhesive and all of your house pieces. Start with the front face: Apply the modelling adhesive to the bottom and sides of each face (glue any areas connecting the bottom of each piece and the floor plan as well as any two house faces together). Next, apply the rear balcony piece by applying modelling adhesive to all top sides it will sit on. Next, glue all the front balcony pieces, including the rear, side walls and the decking Use modelling adhesive to connect all these pieces together, use a try square and masking tape to allow the pieces to set perpendicular to each other. (Connect this section as one, using small wooden blocks to act as a support beneath the decking whilst the adhesive sets). Finally secure the last top curved piece. Use modelling adhesive to secure the rear roof pieces together and then to the back of the house. Do the same with the side roof, leave to set.	**Creating Curved Roofs / Guttering** Take around 5 sheets of black card, laminate each together using a spray mount adhesive between each layer. Take a sheet of dark grey fine glass paper and laminate that over the top. Use a steel rule and a craft knife to cut the laminated card to its correct size to be used as a curved roof. Bend the card slightly with your hands to help the card into a curved shape. Use modelling adhesive to secure the roofs into place on the top and side of the house as well as the porch roof. Finally, take a sheet of HIPS and a 10mm diameter dowel. Cut the dowels into the correct size using a coping saw. Use a vacuum former to heat up and form the plastic round the dowels. Use a craft knife and steel rule to cut out the gutters, then secure them to the rear pitched roof using UHU.
Tools & Equipment	Laptop With 2D design, Laptop Charger, Sheets of Light Grey and Clear Acrylic, Modelling adhesive, Laser Cutter, 1mm Cedar Veneer, 3mm MDF sheet	Laptop with 2D design, Laser cutter, Sheet of 2mm MDF, Double sided tape, Modelling adhesive, Light grey acrylic paint, craft knife, craft mat.	Large 25mm sheet of MDF, Band Saw, Coarse Glass Paper, Pencil, Steel Rule, White & Grey Acrylic Paint, Grey modelling gravel, Roll of modelling turf, Masking Tape, Tracing paper, Spray Glue, Large paint brush.	Modelling adhesive, Try Square, Masking Tape, tissue	Modelling adhesive, Spray mount adhesive, Craft knife, 5 sheets of black card, Sheet of dark grey glass paper, Steel Rule, Craft mat, Sheet of HIPS, Vacuum former.
Health & Safety	• Be careful when using the modelling adhesive, don't get it on your fingers as you could glue them together. • Keep the laser cutter door closed so there is no risk of burning yourself on the laser. • Keep the extractor fan on at all times when cutting so that fumes don't build up in the room, keep fan on at least 2 minutes after each cut.	• Keep the craft knife blade inside when transporting or not using, to prevent accidents. • Keep your fingers out of the way of the blade when cutting with the craft knife. • When using the laser cutter, make sure to turn on the extractor fan before cutting to make sure no fumes escape into the room and cause harm. • Keep the laser cutter door closed so there is no risk of burning yourself on the laser.	• Be careful when using the band saw, make sure nobody stands within the yellow marked area other than yourself. • You should wear eye protection when in the workshop at all times, due to pieces flying off the MDF. • Keep your hands far away from the blade at all times when cutting, to avoid cuts. • Keep the craft knife blade inside the knife when not using it or when carrying. • Cut away from your body and hands to avoid cuts. • Keep the room well ventilated when using the spray glue to avoid fumes building up in the room	• Be careful when using the modelling adhesive, don't get it on your fingers as it could glue your fingers together.	• Keep the room well ventilated when using the spray mount glue, as fumes could build up in the room and cause harm. • Use the spray mount glue next to an open window to prevent fume build-up in the room. • Keep the craft knife blade inside when transporting or not using, to prevent accidents. • Keep your fingers out of the way of the blade when cutting with the craft knife. • Be careful not to touch the hot HIPS as it leaves the vacuum former
Quality Control	• Visually check each piece as it leaves the laser cutter to see if it is the right shape / size. • Check for scorch marks on all pieces before using them in the model. • Make sure each window panes in straight before allowing to set. • Check / remove any excess adhesive with a tissue before allowing to set.	• Check to see if each piece has been cut to the correct dimensions by the laser cutter and are the suitable size before laminating. • Check the veneer against the MDF before gluing the finishing textures on to see if they are the same size. • Test the front door step before painting to see if it is the right size. • Visually check that the laser engravings are to scale on the front door step.	• Use a steel rule to double check the size of the baseboard before and after cutting. • After mixing the acrylic paints, compare the paint colour against the gravel before painting. • Before the paint dries, check if all areas have been covered with gravel. • After drying, check if the pathway is covered evenly • After the turf has been laid, check for gaps between the gravel the grass. • Check for ang gaps between the gravel pathway and the house.	• After gluing each piece, check the edges for any excess glue with a tissue before letting it set. • Use a try square and masking tape to assure that all pieces of the house are at right angles to each other, visually check these angles before and after setting. • Keep visually checking each piece over time to see if the bond has come undone or loose, then act accordingly.	• Check if the card has been laminated properly before cutting, as the card needs to be tightly packed. • Check for any rough edges on the side of the card after cutting, use glass paper to remove this. • Visually check if the roof pieces are secure and are in the right place before allowing the adhesive to set. • Use a ruler to check if the dowels are the correct size before vacuum forming. • Visually check if the vacuum forming has worked successfully before cutting

Record of Making:



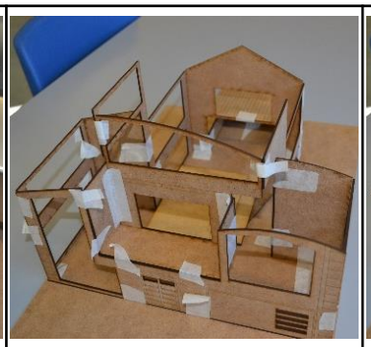
Firstly, I laser cut the floor plan of my house out of 2mm MDF, using the same dimensions from my paper model.



I fixed each house piece on 2D design to account for the thickness of the MDF

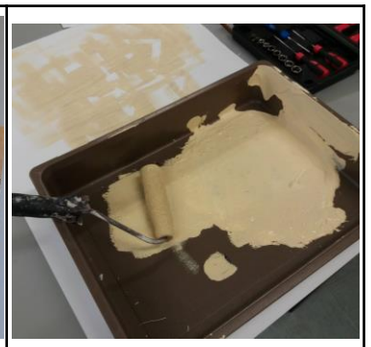
I laser cut the floor plan of my house out of 2mm MDF, so that all pieces can be connected to a base.

I laser cut each house wall from 2D design out of 2mm MDF, checking each one against my floor plan to check if the dimensions were correct.



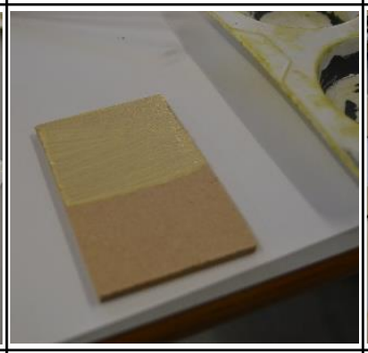
I used masking tape to temporarily connect the house walls together, to check they were the correct dimensions.

(I left the roofing till a later stage). I then disassembled the house and removed the masking tape.



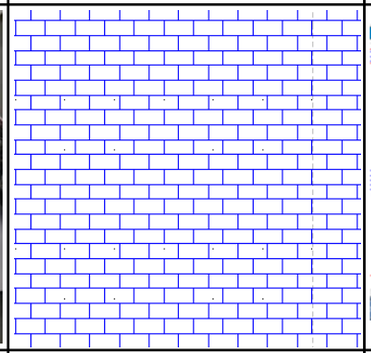
Then I mixed some black, white, yellow and dark yellow acrylic paints in a palette to create a limestone colour.

I then tested various colour combinations on scrap MDF to ensure that I had the correct shade.

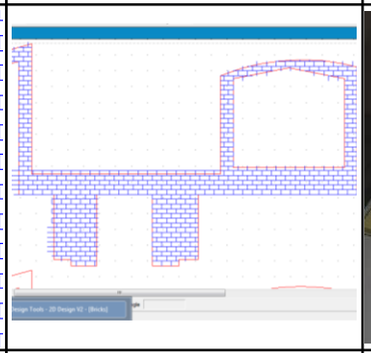


I then painted each house piece using a small paint roller, as well as each side with a smaller paint brush.

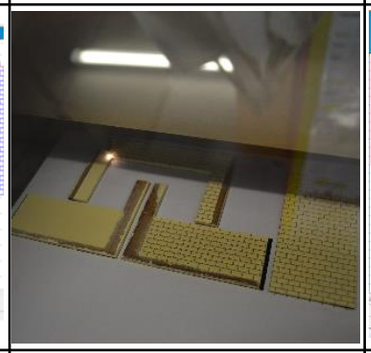
After leaving the first coat to dry, I repeated the process with a second coat to improve the colour of each piece.



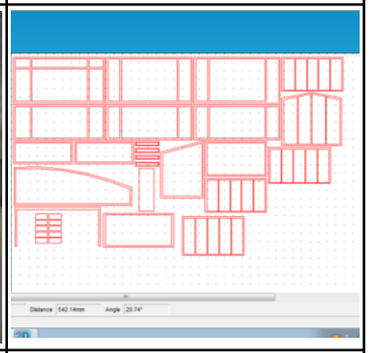
I went back to 2D design, created the necessary brick texture to the correct scale



I then added the brick texture to all my 2D designs of each house face, then sent them to the laser.

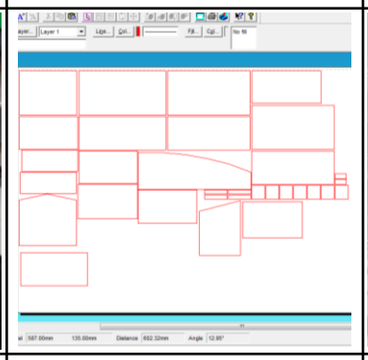


I put each painted house piece into the laser for the brick to be etched on. Using a piece of paper to hold them in place.

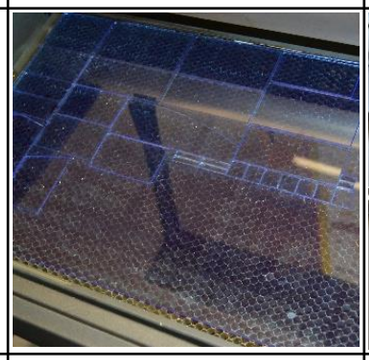


I went back to 2D design and created all the window frames from my existing designs. All on one file.

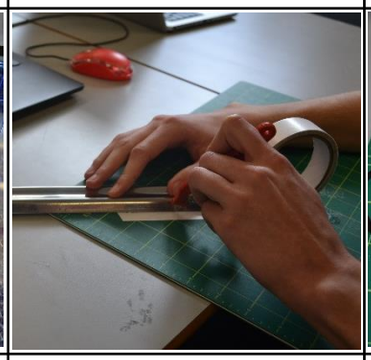
I sent these designs to the laser, cut all my window frames from a sheet of 3mm black acrylic. (with protective cover on).



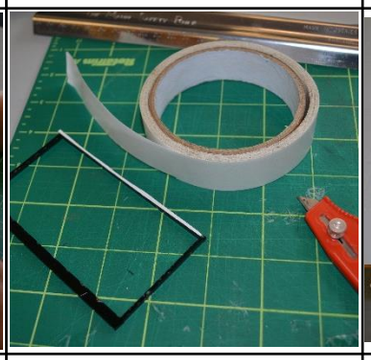
I went back to 2D design and created all the window panes from my existing designs. All on one file.



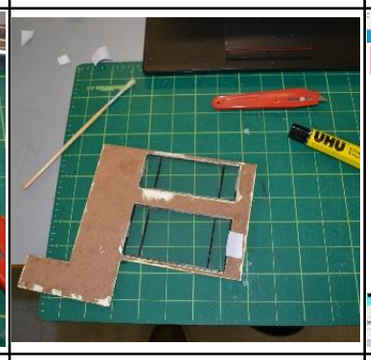
I sent these designs to the laser, cut all my window panes from a sheet of 3mm clear acrylic.



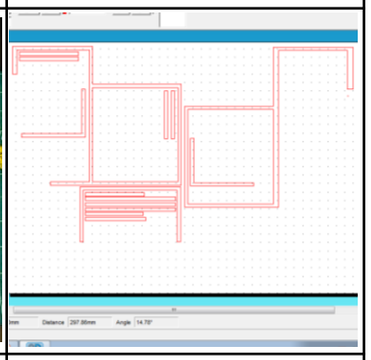
I then cut thin strips of double sided tape using a craft knife, to stick on the outside of each window frame.



Then I connected each window pane to its frame, repeating the process for bifold doors too.

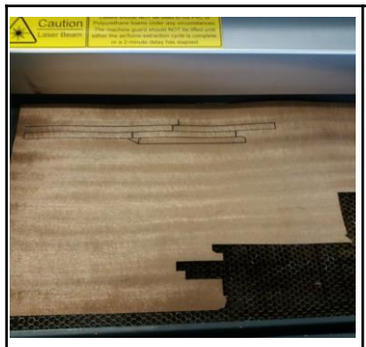


I slotted each window into position without need for masking tape, due to them being the same size as the hole.

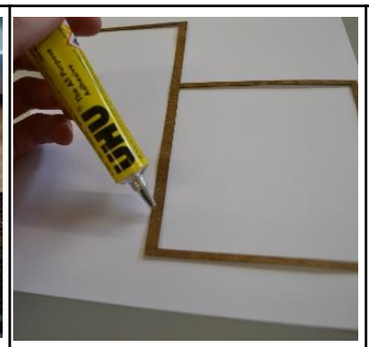


I then designed all the oak cladding pieces on 2D design, using the dimensions from previous designs.

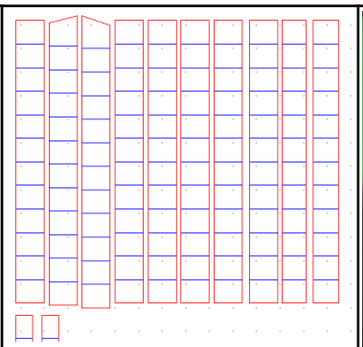
Record of Making:



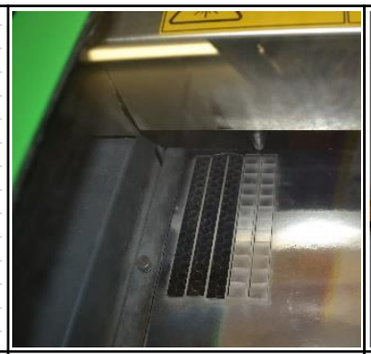
I sent the oak cladding designs to the laser and cut them out of a 1mm oak veneer.



I used modelling adhesive to secure each cladding piece where it needed to be on the house pieces, using a tissue to remove excess glue.

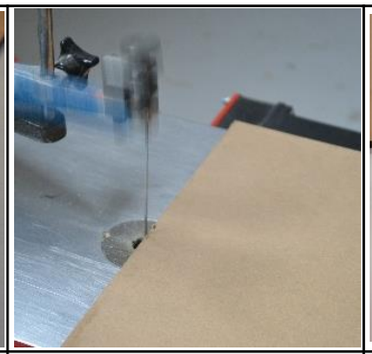


I then designed all the stainless steel corner cladding pieces on 2D design, using the dimensions from previous designs.



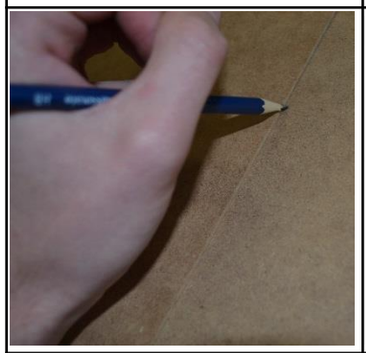
I sent the stainless steel cladding designs to the laser and cut them out of a 1mm sheet of shiny card.

I used modelling adhesive to secure each cladding piece on the corners of most house pieces, using a tissue to remove excess glue.

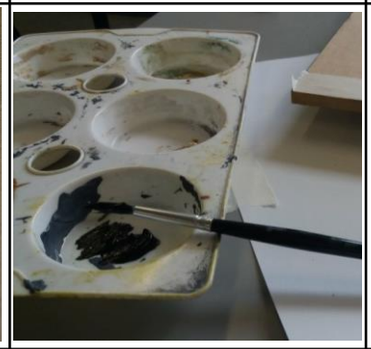


I took a larger piece of MDF and created the baseboard using the scroll saw. (Using previously marked dimensions).

I took a large paint brush and painted the edge of the baseboard black, so that no plain MDF shows on the final model.



I traced around my floor plan onto my baseboard, then used a steel rule to draw the perimeter grave path.



I mixed some grey paint using white and black acrylic paints to match the shade of the modelling gravel.

I used masking tape and a craft knife to surround the pathway, to ensure a sharp edge to the pathway.

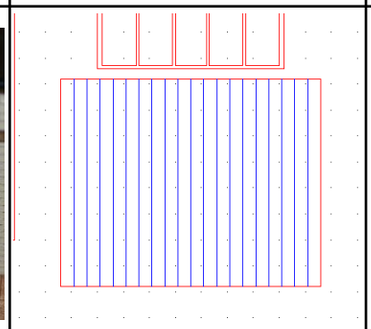
I then created the perimeter pathway. By sprinkling the gravel over the wet paint, leaving it to dry and shaking off the excess gravel.

I used a craft knife and tracing paper to cut the correct shape out of a sheet of modelling turf.

Then I used a spray mount glue on the underside of the turf to secure the grass into position around the gravel pathway.

I used modelling adhesive to secure all lower house walls to the floor plan piece. Using masking tape and try squats to keep walls perpendicular.

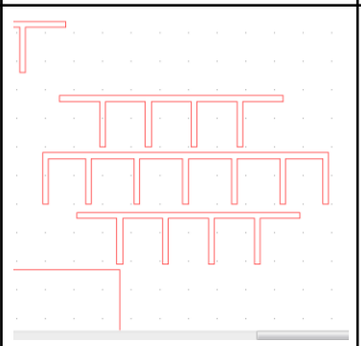
I used modelling adhesive to secure the balcony indent structure at the front of the house, I connected these as a single piece.



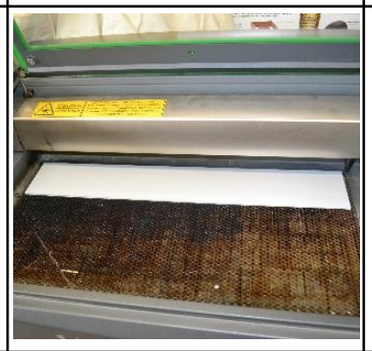
I went back to 2D design to create the front and rear decking pieces, and I designed an etching pattern to represent the planks.

I laser cut my designs for the front and rear decking out of MDF and veneer, then secured them in place with modelling adhesive too.

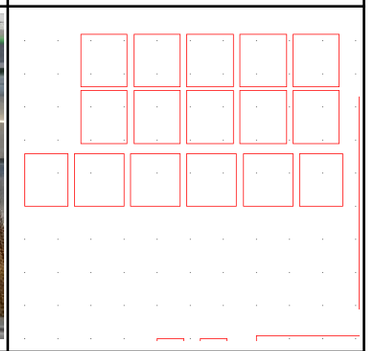
I went back to 2D design, created the rear decking. Laser cutting the design out of both MDF and veneer, similar to the rooftop deck.



I went back to 2D design and designed the balcony railings for the front and rear, keeping in mind, the scale of the house.

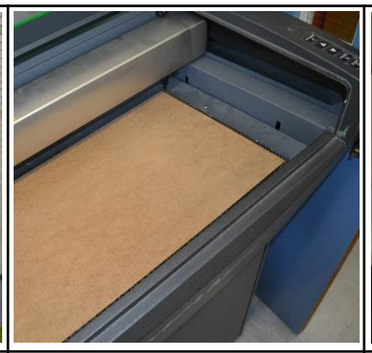
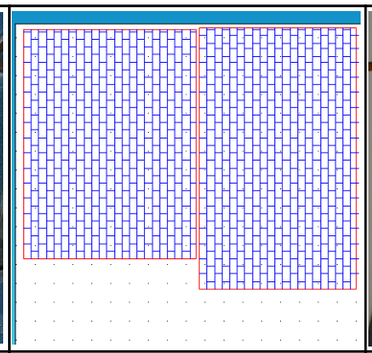
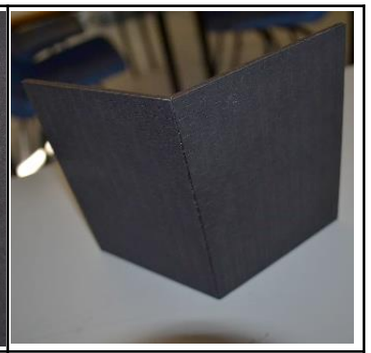
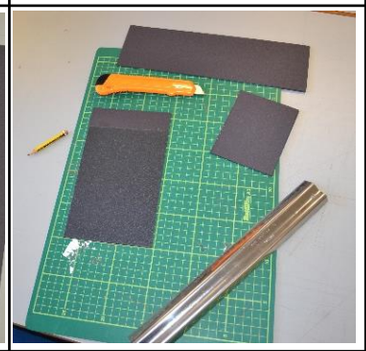
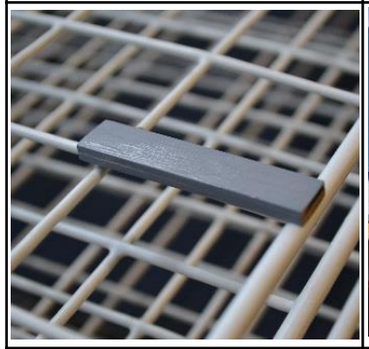
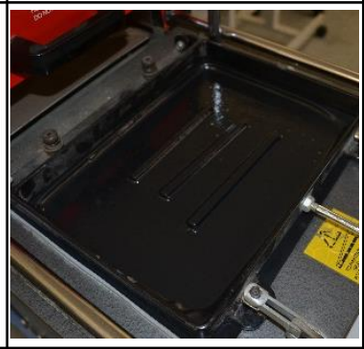


I laser cut my balcony railings out of a light grey acrylic sheet.



I went back to 2D design and designed the balcony panes for the front and rear, keeping in mind, the scale of the house also.

Record of Making:

						
I used modelling adhesive the secure each square of clear acrylic to its respective railing, by gluing the outside of each pane.	Then I glued the railings to each other and to the decking surfaces. By gluing the underside of the railing.	I took my card model designs for the pitched roof pieces and laser cut them out of 5mm MDF this time.	I then proceeded to use the belt sander to achieve a pitch shape by sanding a slope where each piece connects.	I went back to 2D design and laser cut out a roof tile texture onto a sheet of dark grey card.	I used double sided tape to secure the texture to the MDF.	I used modelling adhesive to secure the pitched roof together and used a black board marker to re-colour the side faces of the roof.
						
I then laser cut out all my porch pieces out of 2mm MDF, using previously made designs.	I aminated the internal layers using double sided tape and secured the curved pieces using modelling adhesive.	I then laser cut the same design out of veneer, then secured it using UHU adhesive. (Roof explained in next step).	I laminated 5 sheets of dark grey mat card using a spray mount glue, as well as a sheet of dark grey glass paper.	I used a craft knife and a steel rule to cut each roof shape out, including the top roof curve, side roof curve and the porch roof curve.	I secured the top and side roof curves to the house using modelling adhesive.	I also secured the porch roof curve using modelling adhesive also. Then secured the entire structure to the house front.
						
I laser cut a font porch piece, then used a grey acrylic paint to re- texture the surface using a fine brush. Then left to dry.	I used a coping saw to cut out rectangular pieces of MDF, to the size that my gutters will be. Then I placed them in a vacuum former.	I took a sheet of High Impact Polystyrene, cut it to size using a craft knife then clamped it into the vacuum former.	I then vacuum formed the HIPS around the rectangular MDF pieces, then cut them out accurately using a craft knife and steel rule.	Then I secured these gutters underneath both sides of the rear pitch, using modelling adhesive.	Finally, I placed the two cars on the driveway for the finishing touch. The house is now complete.	

2D Existing Product Research

1. Advantages:

This brochure has a very clean and modern style to it, the modular placement of pictures and text creates a contemporary design which reflects the designs showcased here. The colour scheme is very minimal, however it is enough to keep the design interesting without overfilling with colours. This will grasp the potential customer's attention as it already looks very professional from first glance. Some of the company's best designs are showcased on each side of the brochure which immediately informs the reader of the quality of their designs and finishes. The images also stand out well compared to the text by utilising the correct colour palette.

The company breaks down the processes of the planning phase all the way to design and commencement of construction, as well as informing the customer about their knowledge and expertise. The text is broken up into easy paragraphs to keep the reader interested. Real quotes from past customers have also been added praising the company and the work they did, proving that they will do a good job.

Disadvantages:

From what I can see, there is no company logo present here informing the customer what the company name is from first glance, it is first mentioned halfway into the first paragraph, not providing an easy way to remember the company. There no contact information on the brochure, there only being a website link shown. Which means there is only one way of customers finding out more. It is also hidden in fine print at the bottom of a page, no location of the company or phone numbers are provided which may lead to the reader not choosing to contact the company at all.

Disadvantages:

Overall, I don't feel there is enough text on the brochure about what the company does, most of it consists of short phrases, mottos or slogans, which is effective but doesn't provide much information to future clients wanting to know the specific skills of the company or exactly what the company can do. I feel there could've been a greater variety of images shown on each page, since there is only one on each page. This way the companies skills can be showcased more, since there is plenty of space to do so. (there is a lot of blank space on the title page which could be utilised more effectively).

2. Advantages:

This brochure has a very strong focus on images rather than text, very high quality and professional designs on a large scale are shown here, showcasing the company's best work to any potential customers. A very clear simple logo is shown on all pages of the brochure, clearly stating who the company is as well having a short and sweet slogan at the top of the front cover which will stick in the customer's mind. Plenty of contact information is immediately displayed to the reader at the bottom of the page, giving a variety of ways to get hold of the company. The use of contrasting blue and brown colours allows the images and the text to stand out very well against each other with clear and bold text too.

4. Advantages:

This brochure has a very clear and bold company name and logo making it really easy to identify the company. The colour scheme is very simple yet effective which is very cleanly executed. The images are very large and clear to see, standing out well from the text boxes. There is a very reassuring motto shown quite clearly on both pages, which might stick in the reader's head.

Disadvantages:

The overall design of this brochure is extremely basic and somewhat boring to look at, there being a lot of empty spaces and only two colours. The images don't have much colour to them at all which may not catch someone's eye initially. There is no contact information for the company which doesn't allow the reader to take any action at all if they wish to start a project through that company, meaning this is a waste of time. I feel there should have been a wider variety of images as well as some real life images of finished projects, rather than just CAD designs, to give the reader a better idea of what the company has to offer. Finally, there isn't a lot of information here meaning the potential client may not be as informed as they should be.

3. Advantages:

This is my favourite colour scheme here, the green, white and black modular design is very well executed and professional looking. There is plenty of information about what the company designs as well as a good showcase of the company's previous work, through a range of different designs. There is plenty of contact information on this brochure and a large and outstanding logo. The text is broken up into easy and readable chunks which is straight to the point and what the customer wants to hear.

Disadvantages:

I don't think that there is enough focus on the images in this brochure, the customer will be wanting a large clear view of the designs, and many of them are hidden behind text boxes. I feel like some of the text is slightly difficult to read, mainly the "Our Services" text on the light green background. Although the overall design is aesthetically pleasing it looks a little cluttered and there is too much going on (mainly the bottom of the second page).

2D Product Specification:

Design Brief: To design an Architectural Design brochure which advertises and shows off the skills and abilities that my service has to offer, to any potential future clients. To showcase my previous work let people know a bit more about what architectural services I can offer.

Product Specification:

Function:

- The brochure should contain a variety of images to give the consumer a visual representation of exactly what my service has to offer and use it as a way to show off the wide range of skills I have. As well as to give the brochure more colour and more interesting visuals. I will make sure there are at least two images of varying size and subject focus to keep things different and interesting.
- A bold and large company logo should be added to the front page that stands out clearly, to inform the consumer what my company name is straight away. As well as to help my company be remembered by the reader and stick in their mind. I will test this by seeing if the company logo is the first thing you see on the page, and that it is bold and outstanding.
- A sufficient level of contact information should be displayed on the brochure including address, email address, phone number etc. So that if anyone is interested in my service then they will be able to contact me easily without having to search for it. Meaning more potential future clients. To test this I will check to see if there is all of the above on the brochure and that it is clear to see.
- The brochure should contain informative text on what services can be offered in easy and readable chunks (short paragraphs). The reader will want to know some of the details of my services and how they are carried out, without being greeted with a wall of text. I will test this by making sure information is broken up and mixed in with plenty of images.

Form:

- The overall design of the brochure should look clean and professional which is organised and easy to follow. The design shouldn't look clustered and messy, text shouldn't overlap into images, images could have boarders. If the brochure does all of this then it will create a very good first impression for the future clients. I will test this by checking for all of the above.
- The colour scheme should remain consistent and not contain colours that will clash / contrast. A professional colour scheme shouldn't include too many colours, maybe a couple of colours with a mainly white theme as I don't want the brochure too look childish. I will test this be gaining opinions from peers.
- There should be plenty of colourful images showcasing a wide range of aesthetically appealing designs. If I showcase my best work then there is a higher chance that the reader will want to use my services, keeping the images vibrant helps a lot with professionalism. I will test this by checking over my selected images once completed.
- The brochure must have a range of image and text sizes to keep the layout looking interesting, this will be far more aesthetically pleasing to look at rather than a lot of just small text and identically sized images. To test this I will review the font sizes and image sizes upon completion.

Size:

- The brochure should be printed in A4 size, when it is folded it will be the perfect and-held size. If any larger it will become inconvenient to carry / hand out. If any smaller the text will be too small and there wouldn't be enough space to fit the information required. I will test this by using a ruler to measure the width / length, it should be 21 x 29.7 cm.
- The text should be no smaller than size 10 font, not everyone has perfect eyesight, so text smaller than this will be very difficult to read. To test this I will collect opinions from peers whether the text is a suitable size.
- The images should be large enough to make out specific details form a distance of around 1-2 metres as well as to catch the eye of any passer by. I'll test this by looking at my brochure at these distances to see if the visual details are clear.
- Contact information shouldn't be in small print since this will make it difficult to find, ways of contacting me should be clear so any potential clients don't have to search around for it. I will test this by checking the size and location of this info.

User Requirements:

- All text should be in an easy to read font so that everyone reading is able to understand the information, but at the same time, the font should looks stylish to add to the professional look. Preferably an Arial font of some kind. I will test this by personal judgement once the brochure design is complete.
- The text should be aimed at the correct target audience and not go into too much detail. The brochure should be no more that a couple of pages to keep the information short and sweet to get my points across quickly. I will test this by reviewing the number of pages upon completion.
- Include map of "where to find us" so that if the client prefers to discuss future projects in person rather than over the phone for example, they are able to find me. The map should be quite large and show my location within a large local area. I will test this by checking if this has been added to the final product, and if details are visible / large enough.
- The brochure could include social media links so that the client has more ways of seeing previous work or wishes to keep updated. I will test this by making sure they are included in the final product.

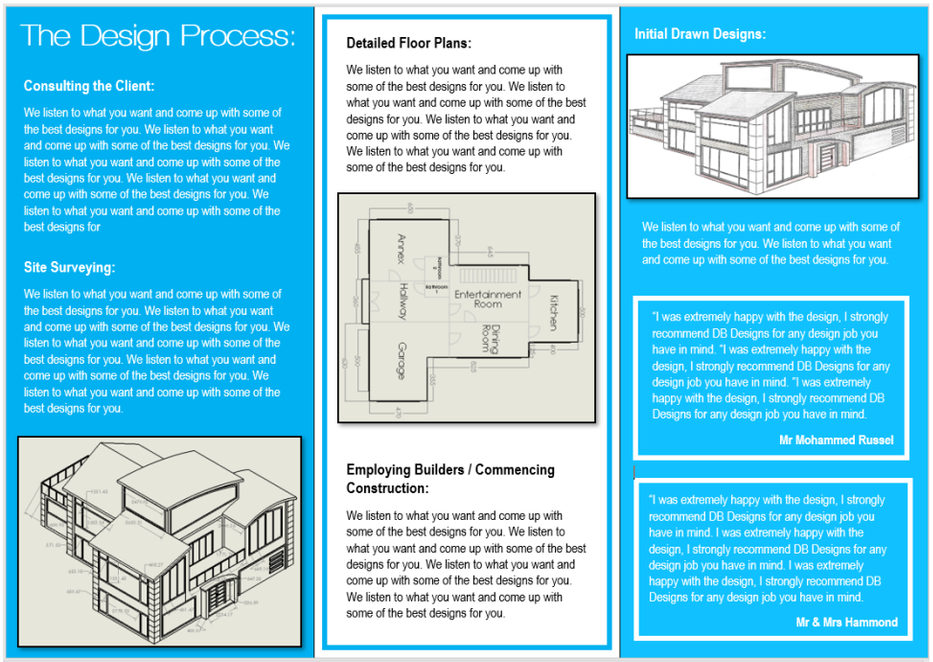
Materials:

- The brochure should be printed on cartridge paper since it has a high quality surface finish. It is an excellent printing surface, very accepting of colour media. I will test this by checking the type of paper that the brochures are being printed on.
- The paper used must be thick / sturdy enough to withstand wear and tear. The client may want to keep hold of the brochure for later use, this needs to be a long lasting product. I will test this by finding out how difficult it is to "accidentally" tear the brochure.
- Materials should be of high quality in order to look professional, the quality of the product will create good first impressions to a future client, the quality of the advertisement will reflect the quality of the architectural services they will receive. I will test this by gaining second opinions from my current clients
- The brochure must be laminated with to give it a nice shiny surface finish, this will add to the product quality as well as look more aesthetically appealing. The outer layer of plastic allows the brochure to be far more wear resistant, it will be unlikely to tear or absorb water and break down. I will test this via visual checks of the end product.

Sustainability:

- The materials used should all be either biodegradable or able to be recycled, so that when a brochure comes to the end of its useful life, materials can be re used and be better for the environment, in stead of contributing to landfill. I will test this by researching biodegradable and / or recyclable materials before making my brochure.
- I will source the paper from companies that re-plant trees once they have been cut, this way I know that my products are not contributing to the consumption of trees without being replanted. I will test this by looking for an FSC (or equivalent) logo on the paper's packaging.
- I'll collect my materials from local sources so that the materials do not have to travel very far to be used. Further transport distances lead to more harmful emissions being put out into the atmosphere and this is something I must avoid. I will test this by researching local suppliers before I order materials.
- The processes used for printing and lamination must not produce any harmful gasses which could contribute to harming the environment, I must try to make the process as green as possible and I will test this by researching the processes behind lamination and printing, and finding suitable alternatives if necessary.

2D Design Ideas 1



Design Advantages:

This design has a bright and vibrant front cover image which immediately shows off a professional and aesthetically pleasing design, which will help catch the potential client's eye. It shows a clear finished product which the consumer will hopefully want.
There is a clean and bold company logo to math, the black outline really highlights the company name and what the service is.
The white and blue colour scheme is clean and professional looking, and the modular layout of the brochure reflects the contemporary and modern designs the company has to offer.
The back page clearly shows a variety of contact details for many different platforms as well as a large map which indicates the company's location.
The company motto on the front is directed at the person reading, and the highlighted YOU lets the consumer know that my company puts the client as priority.
On the last page there are two positive customer quotes which are clearly highlighted and will show the consumer how good my service is.

Design Disadvantages:

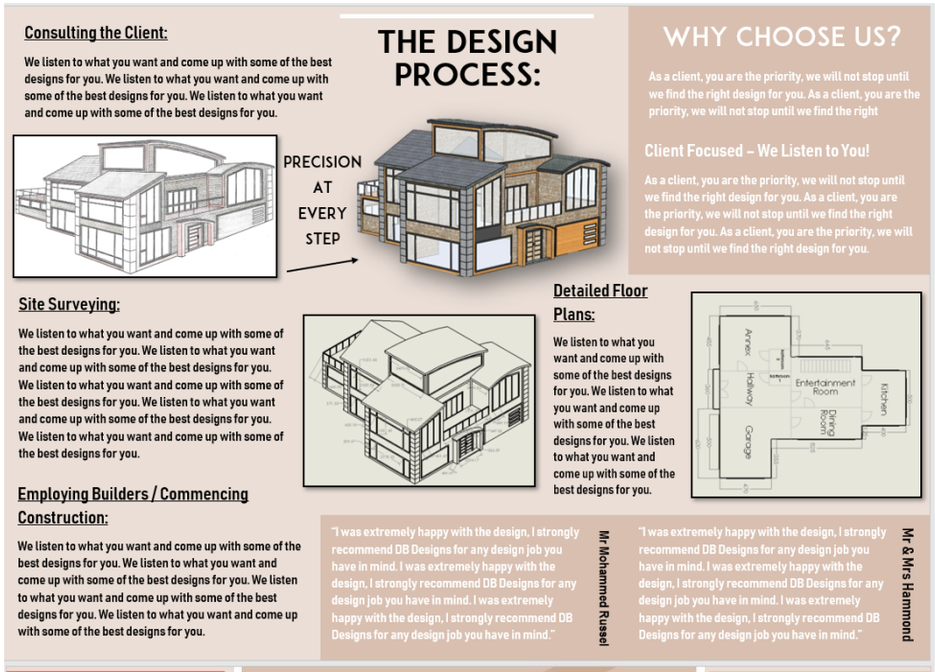
Looking at the front cover, there isn't any background colour behind the logo and image, this appears quite bland and not very stylistic, more colour is definitely needed here. The about us page is fairly bland also, with a white background and two blue text boxes, the design is clean but very uninteresting, I could've added an image here to make it more lively. The images on this brochure aren't as well distributed as I would've liked, since there is a page without any and looks plain as a result.

Will I Take this Design Further? The overall design is nothing special and seems very basic, therefore I will not be taking this design further as I don't think this best represents my company, It isn't unique enough to continue and improve upon.

Design 1

Design Advantages:

This design has a more unique gate fold layout compared to the other tri fold designs, which may appeal more to the consumer.
The larger front cover allows for there to be a much larger company logo and a larger area to show off the main image design.
The front image which shows the SolidWorks screenshot will show the consumer how much care the company takes over their designs, how unique and precise they can be. The colour theme is very natural and comforting, with a more vintage style to it whilst also keeping to the contemporary looking images and fonts, which makes the design a whole lot more sophisticated and professional looking.
The main "Design Process" page is less modular compared to the other designs which could make for a more interesting reading experience, the information is less separated and allows for more information to be included.
The larger back page allows for a larger map which could be read more easily compared to on other designs.



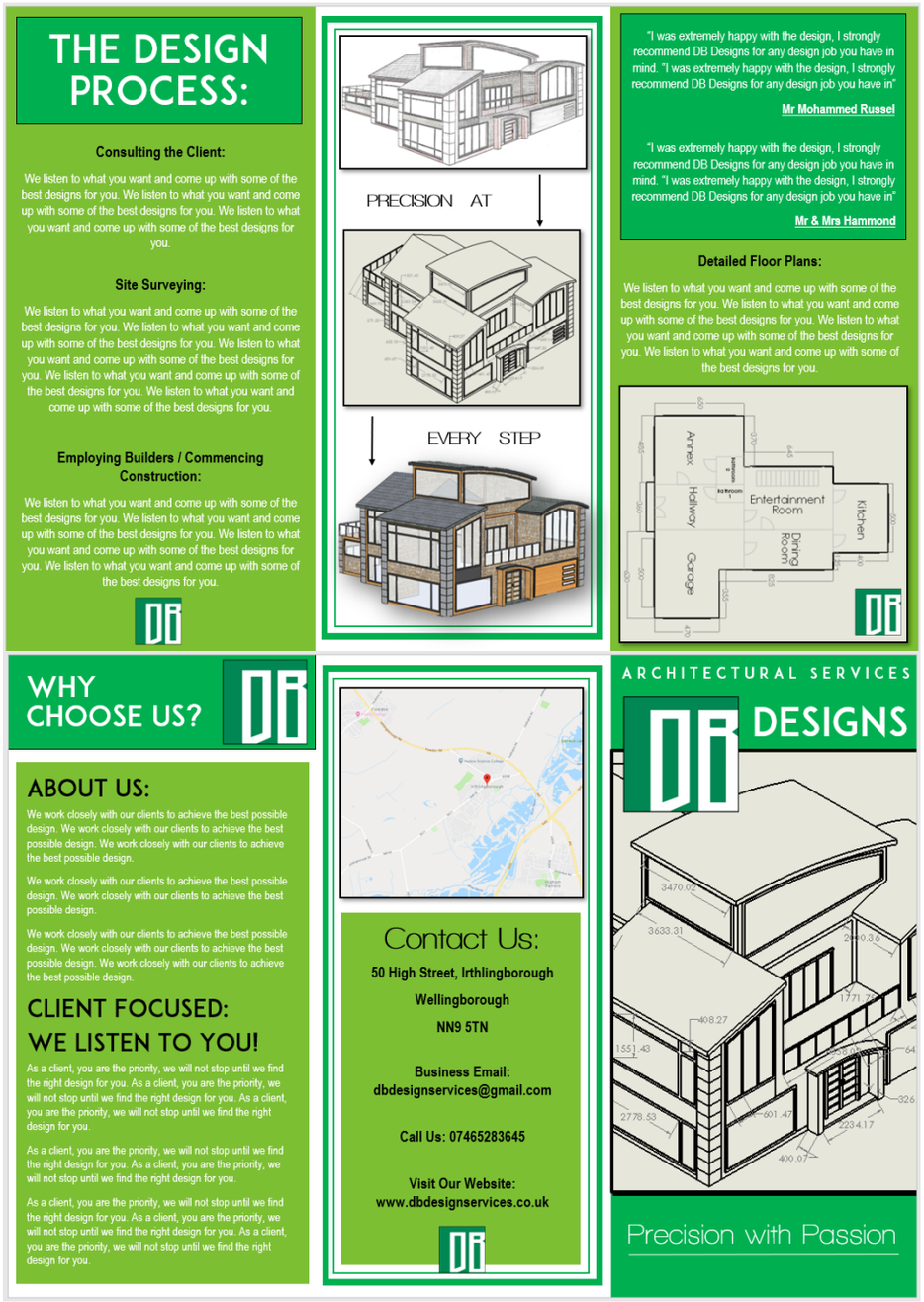
Design Disadvantages:

The colour scheme on this design is not as eye catching as any of the other designs, the pale brown doesn't stand out at all and looks a little washed out. I also feel that there is not enough colour variation, since the boarders and text boxes are only lighter and darker shades of brown. The images also do not stand out from the backgrounds at all, nothing stands out here. To improve I should have added a suitable secondary colour to mix up the design a little. I feel like there could've been a little more shape variation since, there are only squares and rectangles apart from the diagonal stripes across the "Contact Us" page.

Will I Take this Design Further? The layout of the design is unique but the overall colour scheme and design is too bland to be taken any further, light brown isn't the correct colour scheme for the images that I have chosen as they blend in too much. Overall, there are other designs that I prefer.

Design 2

2D Design Ideas 2



Design Advantages:

This design has a small and compact logo, it has been placed in various areas around the brochure to help the reader remember the company better.
The colour scheme is one of my favourites, since the colours are vibrant and eye catching whilst still being mature and professional.
The light and dark green go well together but aren't too similar. The images also stand out well here as well and do not get lost in the design.
The variation of text colour from the headings to the main information adds more depth to the colour scheme.
This is my favourite front cover page out of all my designs, since the logo is very memorable and the CAD software screenshot is the largest. The slogan at the bottom of the page is also my favourite out of all my designs, it is the most catchy and true to the company.
On the "Design Process" page, I like the idea of having a progression from drawing, to CAD software images to the final house render, it shows I am skilled in all areas and will do a good job in designing future houses to future consumers.

Design Disadvantages:

This design is mainly limited by the lack of colour gradient, every page is a solid fill of colour which can look simple and clean but in this case, it makes the design look uninteresting compared to more professionally made brochures. I don't feel like there is enough shape variation either in this design, it makes the pages with all text seem bland and uninspired. Also I should try to have at least one image on every page to also avoid this issue of bland pages. To improve, would give a slight gradient to each page and be more creative with shapes in the corners of each page, to keep things interesting.

Will I Take this Design Further? Since I am unable to decide between the this and my 4th design, I have decided that I will take various elements from both designs. Here I will use the slogan, the logo design, and the progression between drawing to CAD to final render.

Design 3

Design Advantages:

This design is by far the most professional looking and well finished design out of the four. This design is the only design which provides me with the level of professionalism that I need.
The colour scheme is my favourite out of the four the dark grey and turquoise goes really well together, still keeping the clean and simple design. The turquoise has also been given a nice gradient which greatly improves the look of the design and makes it more stylish, which is what all my other designs are lacking.
This design uses a wider variety of shapes compared to others, the use of triangles gives more style compared to squares and rectangles, it also breaks up the colour a little more compared to having a full page of just one colour.
In this design I added more contact information, so that the consumer can follow the company on different social medias, I have access to a much wider audience online than I do handing out brochures physically.
The slogan here highlights that my designs are sustainable, which will appeal to many people.

Design Disadvantages:

The triangles in the corner of each page (especially the front cover) tend to get in the way and take up a lot of space, which gives less space for text and means the brochure will not be as informative. It also means that some text is forced to be printed at an angle which may be annoying for some readers. The shapes also are overlaid on top of images on the front and back page, meaning the images are obstructed slightly, which may reduce the effectiveness of the "Contact Us" map. The nature of the colour scheme also means that the images do not stand out as well as I would've liked. To improve I will make the image boarders white, and keep the aesthetic design beneath the test and images.

Will I Take this Design Further? Yes, I will take this design further since it is the most professional looking and is the most suitable design for an architectural service brochure, I will be using this colour scheme as well as the shape design and the idea of using gradients instead of solid colour fills.

Design 4

2D Product Review

Specification:

Function:

- This brochure does contain a variety of images that show the consumer what my service has to offer and showcases in detail what my best design is. These images however do not give as much of a variety of colour as I would've liked, since it is mostly black, white and grey. The images are varying in size however and do keep the brochure interesting. (Specification mostly met here).
- There is a fairly large company logo on the front page of the brochure, it stands out well and is an interesting / memorable design which will be remembered by the reader, it is also informative and immediately tells the reader what the service is. (Specification met well here).
- This design includes the most contact info, with there being the company address, the business email address, phone number and website link. Also with the addition of the social media links of Facebook, Twitter and Instagram. This gives the reader more ways to contact me and view my designs, it also provides more platforms to share images and advertise. (Specification perfectly met here).
- The brochure includes sufficient information and detail of the company and the different services I have to offer, it is the main focus of the brochure. However there is a "wall of text" effect on one of my pages, since there are no images at all, they could've been more evenly distributed across the pages to keep things interesting throughout. (Specification mostly met here).

Form:

- The design of this brochure is the most professional and complex out of all my designs, due to the addition of gradients and a variety of shapes. The design still looks clean and simple whilst being way more complex and interesting than the other three. My pictures all have boarders (however they can be difficult to see on a grey background). The only issue I have is that the map is obstructed by the address which looks a little messy. (Specification mostly met here).
- The colour scheme of this design is the same throughout, consisting of turquoise, grey and white, no other colours on other pages. The colours are professional and do not look to vibrant or childish, and this will give off a good first impression to potential clients. (Specification perfectly met here).
- I feel the most lacking area of this design is the colour of the images, they are all very pale colours or black & white, also all my brochures have only showcased a single design, I should include a variety of designs to prove that I have lots of fresh and modern ideas. (Specification not met here).
- There are a variety of different text sizes and styles, there are three different fonts and two different font colours, I think this keeps things interesting without looking too messy and clustered. I feel like the images could be more varying in size since they are all the same. (Specification mostly met here).

Size:

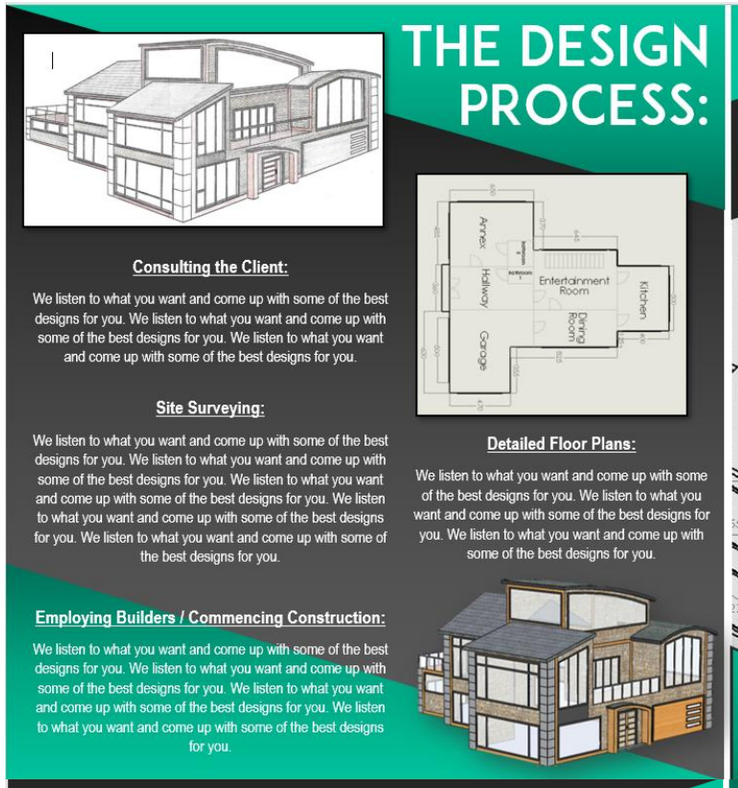
- The brochure is designed for A4 so will be printed in the ideal size, the font size is mainly size 11 and 12 so will be perfectly visible from a distance, the images are large enough to see from afar also. The front cover image is large enough and eye catching also. (Specification met well here).
- The contact information is very clearly visible on the back page, with it all being a larger font size than the other text. So any readers will be able to see it very clearly. (Specification met here).

User Requirements:

- All text in this brochure is in a simple and easy-to-read font, which is stylish and legible without being too over the top. (Specification perfectly met here).
- On the back page there is a large map of "where to find us", showing the local area as well as the location address, however I am unhappy with the location of the text, since it does obstruct some of the map and looks a bit messy. There are also plenty of social media links also located on the back page (Facebook, Twitter and Instagram), giving the reader more ways to contact. (Specification met well here).

Materials & Sustainability:

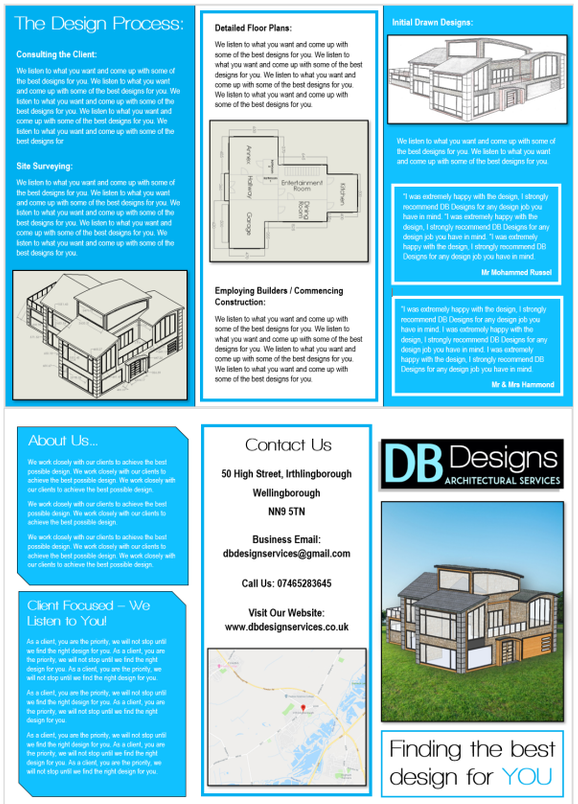
- This design is designed for A4 copier paper and will be laminated using PET, so the brochure will have the substantial thickness and stability to seem professional and durable, giving a good first impression to any potential clients. The brochure will have a good shiny surface finish as will be resistant to wear and tear. (Specification perfectly met here).
- The A4 paper as well as the PET plastic are all recyclable, so that the brochures don't clog up landfills when they are at the end of their useful cycle (specification perfectly met here).
- My paper will be sourced locally and from companies that will re-plant trees once they are cut. So I won't be producing harmful emissions getting the paper and local forests aren't damaged. (Specification will be met here).
- The brochures will be printed with an office printer and will be laminated using a desktop laminator, no harmful emissions will be produced here. (Specification met here).



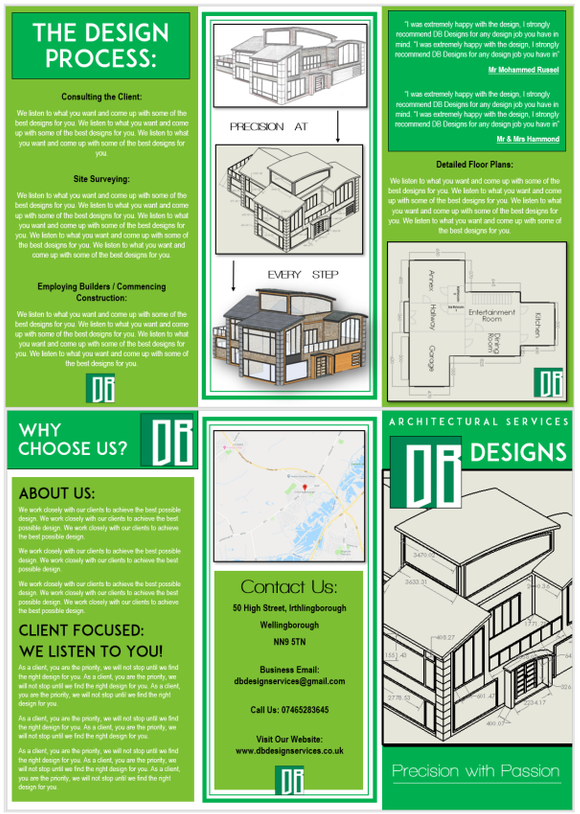
3rd Party Feedback from TENC Students:

Joe: I think the design is very professional looking, the front page clearly indicates that this is an architectural service and draws attention with a high quality design immediately.
Amy: I like the colour scheme and the complexity of the design, the turquoise and grey works well to highlight the images and the white text. There is a variety of shapes which keeps things interesting.
Brandon: The design includes all the essential elements and fulfils the function of a brochure very well. With a lot of detailed information and many images.

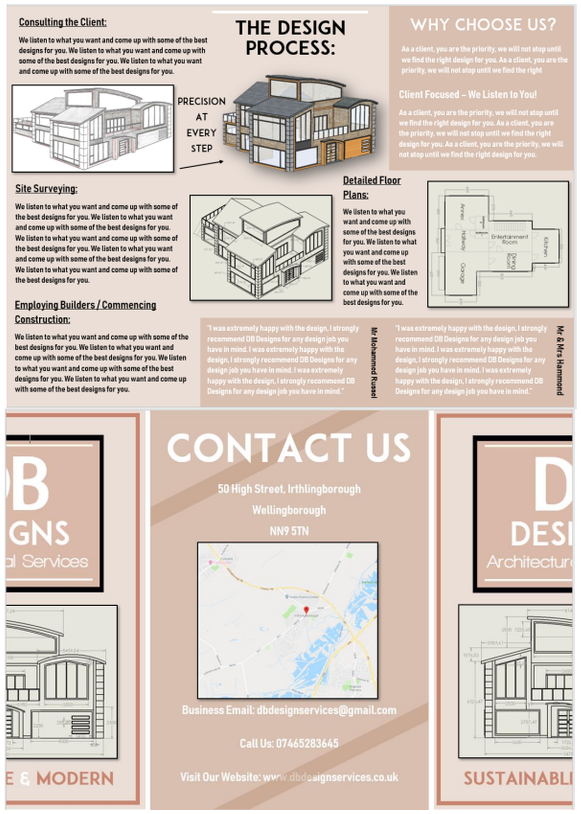
Client Review of 2D Product Designs



We like the colour of this design, the white and light blue goes really well together. Very contemporary and professional. However, we don't feel that he general layout of the brochure is as complex and interesting as the other designs. The images aren't as evenly distributed, to where there are no pictures on the "About Us" page. The shapes are also a little simple.



We feel like the layout has been greatly improved on this design compared to the last, we like more pictures and the difference in shades for the headings. However we don't like the colour of this design very much, because the green is too in-your-face and most of us prefer lighter colours. The logo font is also unclear as the B can look like an R.



The logo on this design is our favourite so far, it is by far the most professional and works well with the design. However the colour scheme feels a little bland and washed out, meaning that nothing stands out and the images blend too much into the design. We also prefer the idea of a triple fold rather than the gate fold here, as most people will find it more awkward to read.

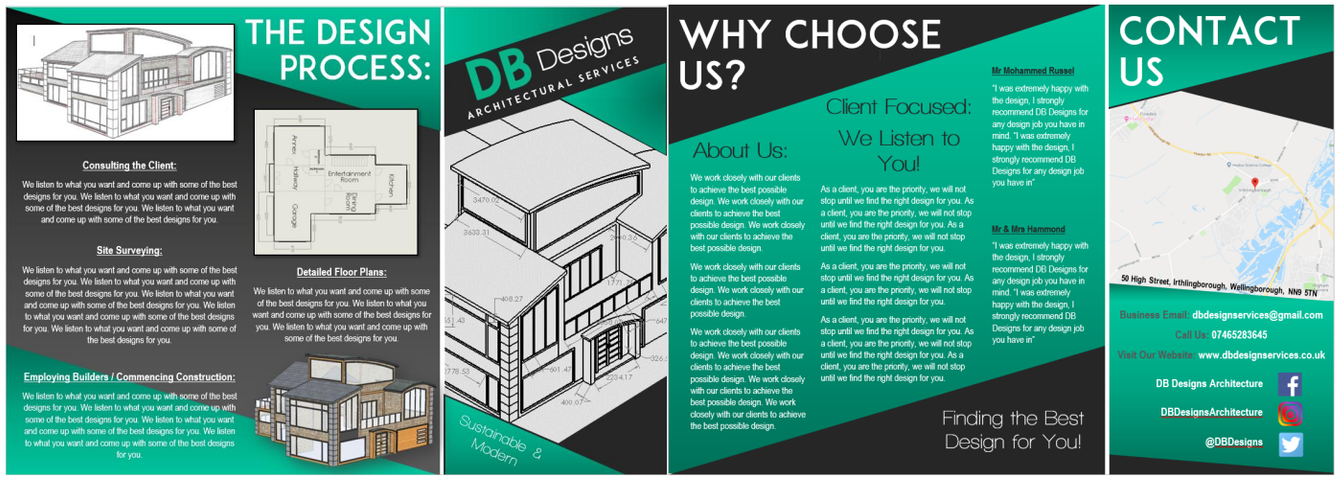
We also like the logo on this design, it does well at standing out on the front cover and works well with the angles of the design. The design here is a lot more interesting than previous designs, the triangles are more aesthetically pleasing than the modular squares. However we feel like the images aren't very evenly distributed, the "Why choose us" page should have some pictures. Also the design on the "contact us" page needs to be improved.

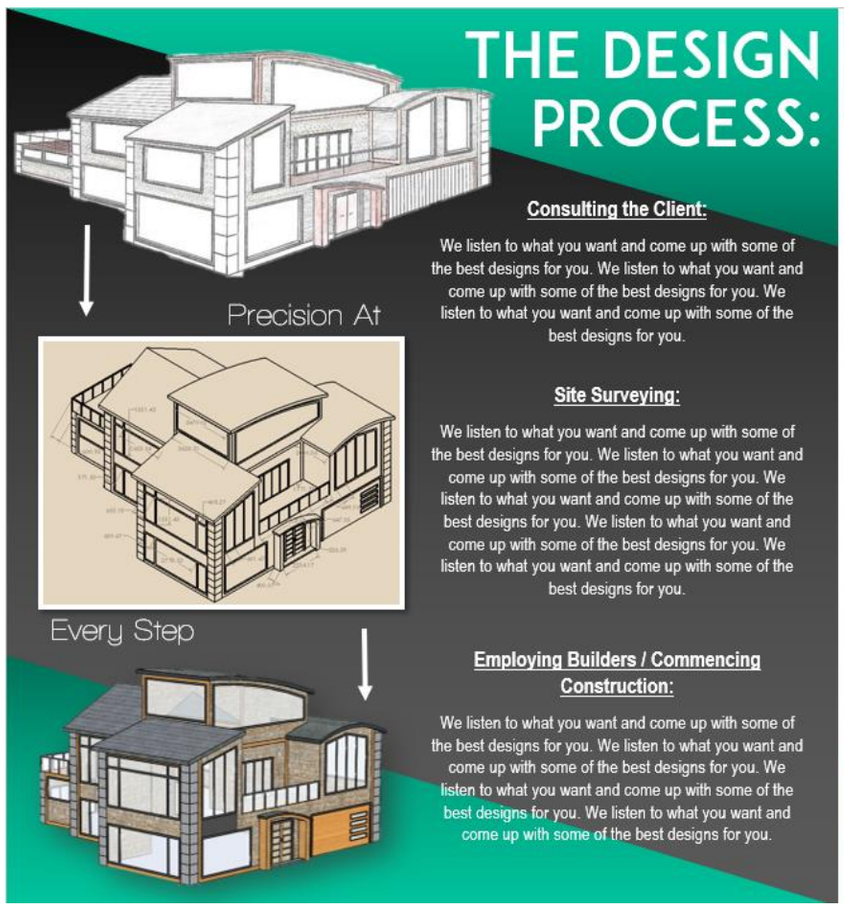
2D Product Development 1

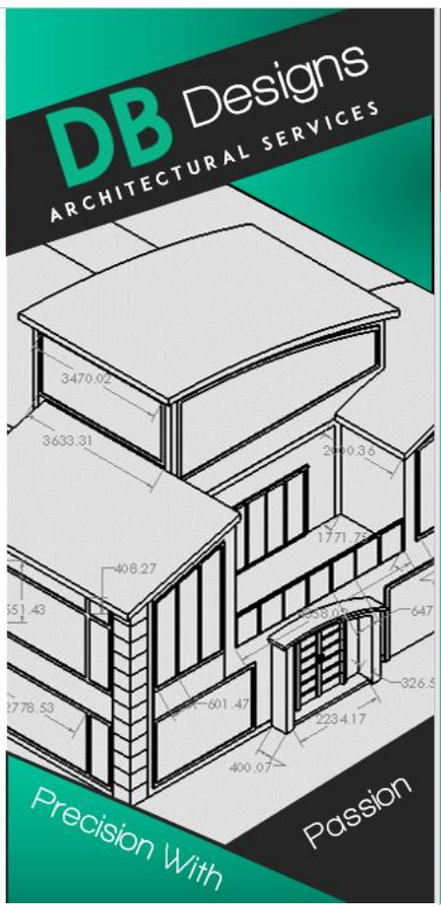
Changes I've Made:

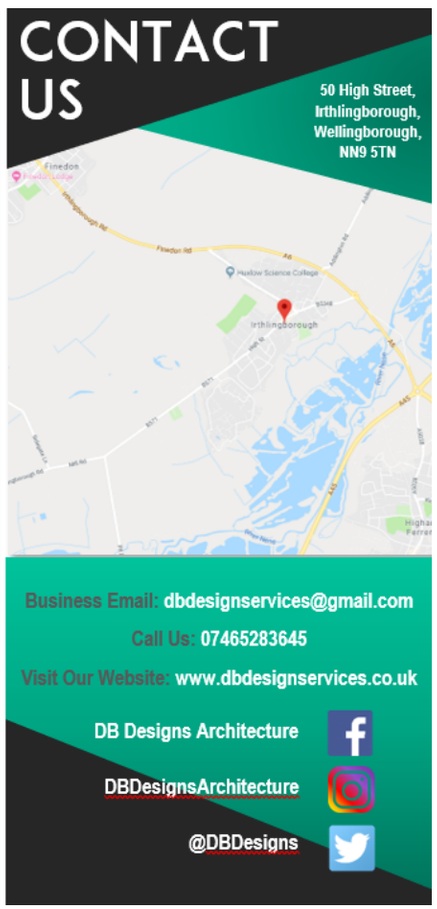
The main focus of this development was to remove the obstruction of the corner triangles, so that the design is kept the same and more information could be added (less empty space). On the "Why choose us" page, I decreased the font size of the main heading and created more room for the "Detailed Floor plans" to be added as well as a card model example image. On the design process page I added a full CAD view of the house design and emphasised the "Precision at every step" evolution from drawing to reality. I also changed the slogan on the front page from "Sustainable and modern" to "precision with passion" as I felt like this suited the company more. Finally, I cleaned up the rear "Contact Us" page by moving the address to amore suitable location, so that it doesn't obstruct the map. Then changed the design of the bottom of the page.

Previous Development









Improvements that have been Made:

The main changes in this development involved adding all the essential information and various elements I liked from previous designs to make the most informative brochure possible. Making the corner triangles smaller on the "why choose us" page cleans up the design and allows for more content, now I have all the client relate benefits on once page, separate from the design process. Adding the cardboard model shows the client that I am skilled in the model making field, so they can have a small visual representation of their designs. Similarly, on the Design process page, I added the CAD view of the house, which again showcases my wide skillset which will appeal to the clients. The rearrangement of the images to show an evolution of the design from drawing to CAD shows that my service is thorough at every step and that a good job will get done. The change of slogan on the front page has also improved the design because although Sustainable and Modern is exactly what my house designs are, I felt like Precision with passion is more catchy and might stick in the clients mind better. I feel the back page looks more clean now, since the map isn't obstructed with the site location, so the reader can see the map more clearly and space is utilised better. Finally, the pictures now have a white boarder instead of black, which highlights the images better on top of the dark colour scheme.

Client Feedback:

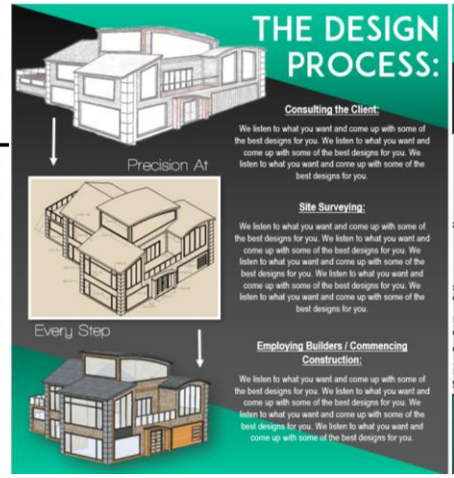
This is a great development, we love that there are more pictures around the brochure, the idea of progression from drawing to computer render will reassure the reader that this is a great service. The "Why choose us" page now looks a lot more interesting and contains a lot more useful information for the reader. The "contact us" page now looks a lot better than before, the map isn't obstructed any more and all the social media likes will mean great exposure to the company. The slogan on the front page now sounds more convincing and true to the company.
On the other hand, we think the colour scheme is a little too vibrant, the green is too in-your-face again, the design would look much better with a lighter shade of blue. We would like to see more social media links and a different font to the logo (to fit in better with the rest of the design).

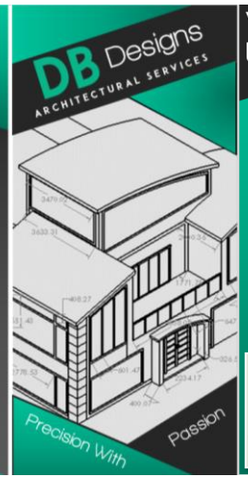
2D Final Product Development:

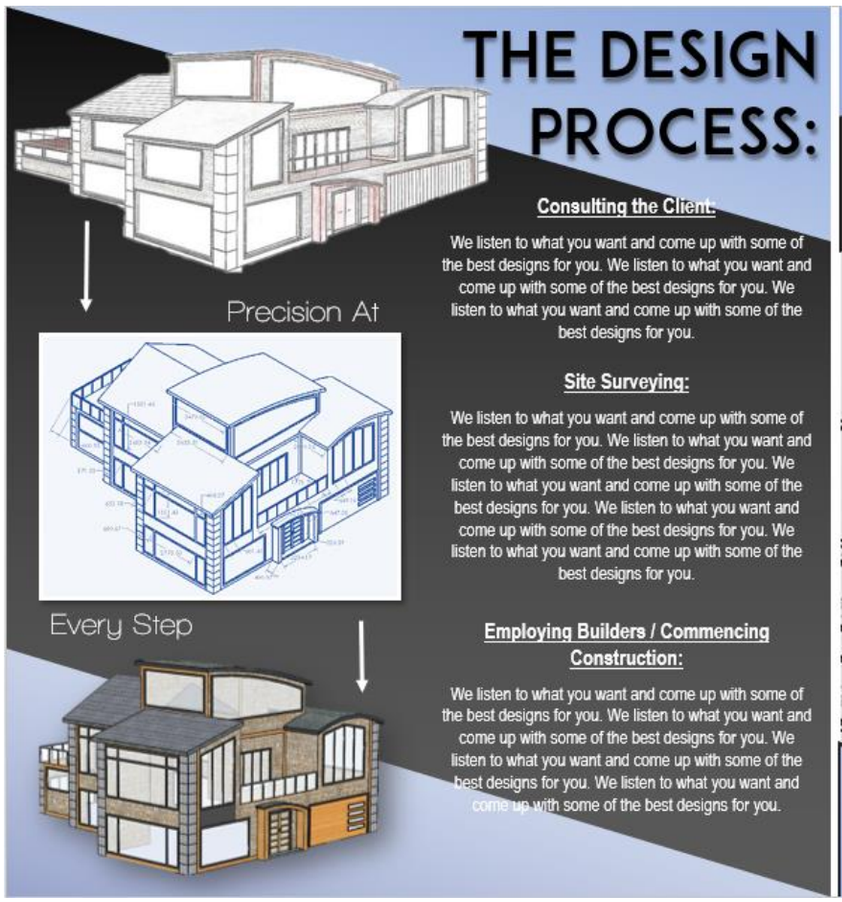
Changes I've Made:

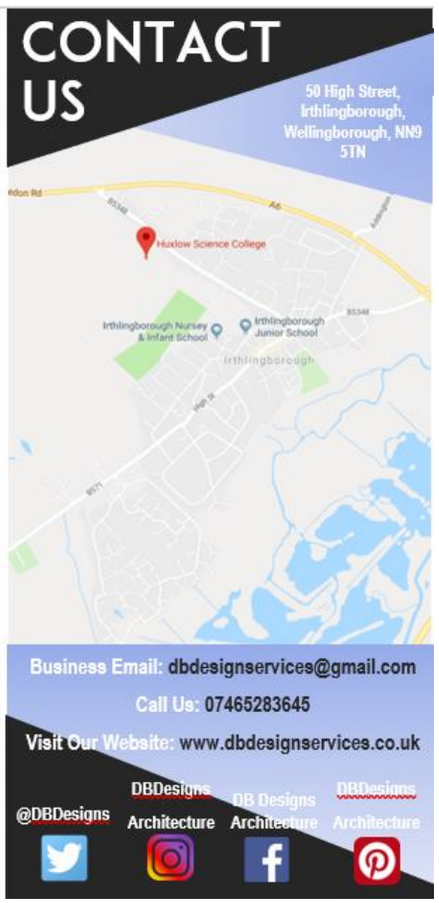
There aren't very many changes here since with the previous development, I was very happy with the design. I have tweaked a few parts: The layout of the contact information has changed on the back page to clean up the design a little. I have also added a Pinterest section in the contact information section as a new way to find the company online. On the "Why choose us?" section I switched the colours to match the Design Process section. Also on that page is rearranged the text into a better form, which allowed me to add a title to the customer feedback section. Finally, on the front page, I changed the font of the main logo, since the last one felt a little out of place.

Previous Development









Improvements that have been Made:

The contact information page has been greatly improved, the map of the local area is now much larger, to allow a greater area to be seen. The contact information has been rearranged into a more visually appealing format, with the social medias horizontally along the bottom and the other information vertically above. The addition of Pinterest allows another way for people to find out about the company, so is a must- have. The titles of the two information pages have been made more visually appealing with black text and a shadow. The swapping of the colours on the "why choose us?" page gives a greater contrast to the information text, making it easier to read for all audiences. Rearranging the text gave me room to explain the customer feedback section. The cleaner design of the front logo gives a better first impression to the reader, there is a more contemporary look with a less childish font, better representing the company. Finally, I increased the contrast of the text "Precision with passion" and "Finding the best design for you".

Manufacture:

I will manufacture the brochure from 135gsm cartridge paper, since this is the ideal thickness for a sturdy brochure. This paper is widely available and inexpensive meaning we can source the paper very easily. This is slightly above average thickness for cartridge paper, meaning it will feel high quality and expensive to the client reading the brochure. I will also laminate the brochure with a layer of sticky back plastic, this will further increase the thickness of the brochure whilst still allowing it to be folded easily. The shiny coating will allow the brochure too look more professional and expensive without increasing the price of production too much. The laminate will increase the lifespan of the product also, since it will be protected from water damage due to the waterproof layer round the paper. As for the industrial printing process: I will use offset lithography so that thousands of leaflets can be produced in a short space of time due to it being a continuous process. Offset lithography also gives a crisp, vibrant and professional grade image, this is what my clients will expect.

Client Feedback:

We are extremely happy with this design now, the colour scheme has been improved a lot, the brochure now looks a lot more professional and expensive, which gives the house design the justice it deserves. There are a good amount of pictures showing off the design well and allows the reader to see all the skills that you have to offer. It is good that the customer feedback is now labelled so the reader can see positive words said by previous clients. We like the look of the new logo, the font looks much better, it fits the design better and looks more contemporary. The "contact us" page looks much better, we prefer this layout much more. Its also great that the reader now was another way to contact the company. Overall, we are very pleased with the finished design.

Production Plan (2D Brochure):

This production plan will allow me to allocate a set amount of time to different parts of production. So I can check if I am working at the correct pace, and are doing the correct things in the right order. I will refer back to this plan before and after every lesson, so I know what I am doing before and after each lesson. I shouldn't take longer than the time allocated for each step.

Time	1 Hour	1 Hour	2 Hours
Activity	Open up your chosen software (Word , PowerPoint, Publisher). Then change the page layout to suit the shape of the brochure, this involves two a4 pages, each split into two segments, with one segment being double the width of the other. You may want to do a test print to ensure the page layout is correct and that the brochure will work in reality before any design is put onto it.	Open your chosen software again, take a good look at the logo from the design you have already. Use the "Walkway Bold" font for the "DB", ensure it is a light blue colour. Next to it, use the "Northern Lights" font to write out "Designs". Once you are happy wit the size and position of the texts, download the logo and paste it into your chosen software. Move the logo into place on the design.	When using word: Insert a picture of the CAD render of the front of the house design. Make it large to show off the design and make it the first thing the reader notices. Start to add various triangular shapes in the corners of the front page. Colour the triangles a mixture of light blue and grey, trying to alternate as much as possible. Ensuring they are large enough not to leave any blanks on the page. Leave a dark grey banner for the logo to sit over. Finally add the slogan at the bottom in "Walkway Bold" font. Finally, add white fades to the blight blue triangles to add professionalism and complexity to the design.
Tools & Equipment	Laptop with Word, PowerPoint or Publisher installed. Laptop charger, a suitable work desk.	Laptop with Microsoft Office and an internet browser installed, Laptop charger & work desk.	Laptop with Microsoft office installed, Laptop charger, a suitable chair, work desk and mouse.
Health & Safety	• Try not to use the laptop for too long as this can give you eye strain. • Keep the room lit well so that you can reduce the effects of eye strain • Make sure to take regular beaks to prevent back strain etc.	• Make sure you are seated comfortably and the desk is the correct height to reduce back strain. • Take frequent breaks to reduce finger and eye strain. • Keep a safe distance away from the laptop screen so you don't damage your eyes.	• Take frequent breaks during this two hour period to prevent back, eye and hand strain. • Keep the lights on in the room to reduce eye strain also. • You can reduce the screen brightness if necessary to reduce the glare onto your eyes.
Quality Control	• Use the printout to ensure the brochure folds together properly once the designs are added. • Check the software to ensure the page size is a4 before you continue any further	• Visually check the logo design before you download it to save time repeating the process. • Visually check if the logo is the correct size and angle on the page after you add it to the brochure.	• Do a visual check at the end of making the front cover to ensure all essential elements are there. • Make sure the logo is bold, stands out and is large • Ensure the design looks professional and expensive.

	1st Hour	2nd Hour	3rd Hour	4th Hour	5th Hour	6th Hour	7th Hour	8th Hour	9th Hour	10th Hour	11th Hour
Establish Layout	■										
Recreate Logo		■									
Recreate the Front Cover			■	■							
Translate over Back Page					■						
Recreate Two Internal Pages						■	■	■			
Write Out Information								■	■	■	
Print Out + Laminate											■

Time	1 Hour	3 Hours	3 Hours	1 Hour
Activity	Start by going onto google maps, here you can take a screenshot of Irthlingborough, make sure the marker is pointed at a suitable location and take a screenshot. Insert this into the design. Add more light blue and grey triangles with a "Contact Us" title, add fades and ensure there are no blanks on the page. Next add contact information for Email, Address, Postcode as well as social medias with their respective logos.	Start by making the background grey, on each page add two light blue triangles in the corners. Make sure to add a white fade on each. Be sure to add the titles "Why Choose Us?" and "Design Process" on each page. Add the text, finding the best design for you on the first page. Add the image of the paper model here also. Add the house drawing, CAD and CAD render of the house as well on the design process page, in a line with arrows between. With "Precision at every step".	Next, write out the information on the two internal pages. Start by adding client comments onto the "Why choose us?" page, to give the reader confidence that you will do a good job. Write a few paragraphs about the company as well as reasons to choose the company over others. On the design process page, then write out a fairly detailed recount of what goes on in the house designing leading to eventual construction.	Next send the finished product over to an electronic printer. Set the paper to A4 and the printer to double sided printing, print off a copy. Use a craft knife, steel rule and a craft mat to cut out the brochure if necessary. Fold the brochure in the necessary places so that it can be held in a booklet form. Next, run the brochure through a desktop laminator to add the shiny and professional finish. Now you have a finished product.
Tools & Equipment	Laptop with Microsoft office installed, Laptop charger, a suitable chair, work desk and mouse.	Laptop with Microsoft office installed, Laptop charger, a suitable chair, work desk and mouse.	Laptop with Microsoft office installed, Laptop charger, a suitable chair, work desk and mouse.	Electronic printer, Charger and laptop a mouse, Desktop laminator, Craft Knife, Steel Rule, Craft Mat
Health & Safety	• Keep a safe distance away from the laptop screen so you don't damage your eyes. • Keep the room lit well so that you can reduce the effects of eye strain • Make sure to take regular beaks to prevent back strain etc.	• Keep the lights on in the room to reduce eye strain also. • You can reduce the screen brightness if necessary to reduce the glare onto your eyes. • Try not to use the laptop for too long as this can give you eye strain.	• Make sure you are seated comfortably and the desk is the correct height to reduce back strain. • Take frequent breaks during this three hour period to prevent back, eye and hand strain. It is a long time to be working at a desk for	• Be careful when using the craft knife, be sure to cut away from the body and put the blade away when carrying or not using it. • Keep a safe distance away from the laptop screen so you don't damage your eyes.
Quality Control	• Make sure the map is the correct size and zoom, make sure that it readable and covers a suitable area • Ensure you have the correct contact information, no spelling errors in the addresses. • Make sure all social medias have logos next to them	• Do a visual check to make sure all the pictures are in their correct spaces and are distributed evenly throughout the brochure. • Make sure there are no blanks in the brochure and that the design looks professional.	• Read back what you have typed throughout the brochure to check for spelling or grammatical errors. Word should check this for you. • Ensure all text is evenly distributed, is in a suitable font (Arial) and is at least size 12.	• Visually check the brochure upon printing, check for printing error / colours not printed properly. • Check the accuracy of your cutting with the craft knife. • Visually check for air bubbles when laminating, should be none.

2D Production Flow Chart:

Start

Firstly, open a blank document in Word / Publisher / PowerPoint, split two pages into two separations each. One being double the thickness of the other.

Make sure the page layout is correct and will work in reality.

Mark each page with a temporary title, print off the pages and assemble the brochure to check if all sides are in the correct location.

Make sure all sides are in the correct places, alter if needed

Next, create the company logo on a browser logo making software, you can choose to make it in Word / Publisher if you wish. I recommend THE HOTH- Free Logo Creator. Then place the logo onto the front page

Ensure that the logo looks interesting, professional and unique.

Place a large image of a CAD render of the house in the centre of the page. As well as various triangles in the corners of the page to build up the design.

Ensure the image is a suitable size as well as the triangles.

Recolour the page light blue and grey to give a professional colour scheme. Add fades to the shapes also. Add the slogan at the bottom of the page also.

Does the colour scheme & Design look professional? Can you see the slogan?

Next, add the title “Contact Us” to the back page and add similar grey and blue triangular shapes in the corners, ensure the shapes have the same professional gradient.

Add the contact information at the bottom of the back page, Include Email address, Postcode, Address, Website Link. Facebook, Instagram, Twitter, Pinterest with their respective logos.

Is all contact information the correct size, organised correctly? Does the design look professional.

Go onto Google Maps, take a screenshot of Irthlingborough in a suitable zoom, add the screenshot onto the back page.

Next, Recolour the two internal pages grey and add two blue triangles in opposite corners of the page. Add the white gradient here also.

Does the design look clean and professional? Are there any blank spaces?

Next, add the titles: “Why choose us?” and “Design Process” in large bold fonts in the top corners of each page. Also add, “Finding the best design for you” in the bottom corner of the “Why choose Us?” page.

Are the titles clear to see and stand out from the background?

Add pictures of the floor plan render on the bottom left corner of the “Why choose us?” page and a picture of the paper model in the top right. Add boarders to pictures

Add suitable pictures: Add the House drawing, Orthographic view and CAD render in a line on the Design process page, with the title: “Precision at every step”.

Are the pictures in suitable locations on the page? Are they the correct size?

Next add information on both pages: Write paragraphs about the design process on the design process page, then write a paragraph “About us” and how the company is client focused.

Add client feedback of the “Why choose us?” page, including the names of the clients and what they have to say.

Are there any grammatical errors or spelling mistakes?

Check one last time if everything in the design is correct before printing.

Print off the finished brochure with an electronic printer, set the page to A4 and to print double sided colour.

Visually check for printing errors: Have the colours been printed properly?

Use a craft knife, a craft mat and a steel rule to cut out the brochure if necessary.

Is the brochure cut out properly, are there any blanks down the sides?

Use a desktop laminator to laminate the brochure to give a shiny professional finish.

Are there any air bubbles? Has the brochure been laminated successfully?

Finish

Testing & Evaluation: Modifications & LCA

Model Modifications Made:

Since the CAD development of the design, I have made a few small changes to the house as I've built the 1:50 scale prototype in order to attempt to change the design for the better.

- In reality, the main functional addition to the house was the addition of PVC guttering to the roofs. Upon finishing the construction of the prototype, I then realised that the water runoff from the roofs will not have anywhere to go and end up dripping down the sides of the house which will induce rotting and other staining to the property over time. So I added some black PVC guttering on the rear pitch as well as the flat side roof to deal with this issue. I modelled the gutters using a vacuum formed sheet of High Impact Polystyrene to give a realistic look and texture to the gutters. I modelled the gutters black as my clients would prefer this, they made it clear to me that they disliked white PVC on the property as it would not fit in with the colour palette that I am going for. By adding gutters I have increased the lifespan of a lot of materials on the sides of the property and have prevented water from running down behind the cladding a rotting the wood after a few years.
- I also added a rear decking to the house connecting the back bifold door to the garden and the perimeter path. The decking is slightly elevated above the grass level and is made from a single rectangle of 2mm MDF and laminated with a single sheet of etched veneer to give a realistic decking texture. In reality, the rear decking allows my clients to have a suitable area to walk on instead of walking out of the back door onto grass. In the future my clients can host family outdoor events and place a table and chairs outside. Without the decking it destroys the purpose of the bifolding door as it is used to connect indoor and outdoor cooking & eating in the summer.
- The main aesthetic addition to the house was the gravel pathway round the perimeter of the house. The pathway is 1.5m wide when scaled up and takes the exact shape of the house, the grey gravel breaks up the grass from the edge of the house to give a professional outline to the property. In reality the pathway can provide a way for my clients to walk around the house from the front to the back garden without entering the house. This will be useful for everyday life.
- I have now added a driveway to the house which in reality gives my clients an easy access route driving to the garage from the street. The gravel of the driveway connects to the perimeter pathway also. In terms of aesthetics the curvature of the driveway gives a unique design that reflects the look of the house, this is necessary for my clients in terms of functional and aesthetic aspects.

Modelling Methods Altered:

- For the stainless steel cladding on the corners of the house, they were originally meant to be modelled with an aluminium sheet which would be laser cut and etched on. However when I came to laser cutting the metal, It didn't work and I was forced to find another way of replicating the texture, so I obtained a sheet of shiny card in stead (then used the same method). This benefited me because the weight of the cladding has decreased and a smoother surface was achieved. The card gives the realistic finish I was hoping for.
- For the grass surrounding the edge of the house, I was originally meant to be made by applying green flock adhesive to the base board using a paint brush, then sprinkling faux modelling grass over the top and shaking away the excess. This would've been a quite time consuming process and could possibly leave gaps or uneven grass. Instead I used a roll of green modelling turf, I cut this to shape with a craft knife and glued the whole thing as one piece. This was far easer and the grass is more to scale this way. However the shade of green is not as realistic.
- During my model testing the limestone brick were created using a blue-ish grey paint, I wasn't happy with this colour initially. I mixed together some more yellow-ish colours and then created a new limestone shade that I was happy with. I also etched the bricks using a different 2D design pattern that was to the correct scale.

Life Cycle Assessment:

I will be testing and evaluating my final model prototype to see what affects on the environment my final model has and how sustainable it is. I'll do this by testing my model against a series of topics involving the full life cycle of the model and its materials. I will be discussing:

- The raw materials used to construct the model
- The manufacturing process its self of the prototype
- The distribution of the model now that it has been constructed
- The use of the model and the length of its useful lifetime
- Finally, the end of the product's life cycle and how it can be recycled afterwards.

Raw Materials:

The majority of the model was constructed using 2mm Medium Density Fibreboard sheets, this includes the baseboard, the walls of the house and the decking pieces. MDF is a manufactured composite made from recycled wood fibres bound together by wax and a resin binder. This means that MDF is sustainable in the sense that the wood fibres are environmentally friendly provided that the trees are re-planted after they are cut. Making it a good material for the majority of the house. However I have to be sure that the materials are coming from reliable sources that replant their trees as this could result in degradation of the countries natural forests which will have a negative impact on the environment in the future.
Another main materials was acrylic plastic, which I used for the windows, window frames, balcony railings and balcony panes. Acrylic plastic is manufactured from oil and natural gasses which are fossil fuels. Meaning that the production of acrylic plastic can harm the environment given a large enough production scale. The raw materials are finite and very precious, meaning we will eventually run out. On top of that, the manufacturing process itself produces a lot of fossil fuels which harm our atmosphere.
The last main material I used was black card (around 400 gsm). I used this card for the roofing of my house. The slate shingle texture was made from etched card as well as what made up the thickness for the curved roofing also. The card its self is made from wood pulp and recycled waste paper. The wood chippings are boiled to form a pulp, the process is using all sustainable materials as trees can be replanted and the paper is recycled.

Manufacture:

The main method of manufacture for producing all the correct MDF shapes was through laser cutting. I created each design on 2D design on a laptop and sent each design over to the laser cutter where it would automatically cut out the design from any material I placed into it. Meaning I had pinpoint precision and accuracy. The accuracy of the laser also meant that I could save materials by tessellating the designs to reduce waste, this can be seen on my diary of making. However If I were to do the project again I would have done this to all materials as I spent too much time and too many materials not cutting all of my pieces together in one go. The machine is electronically powered meaning it will use up a lot of electricity / power if you don't use it efficiently. I could have used laser plywood instead of MDF since it is a less dense wood meaning less power would've been needed to laser cut all the house walls. Which would have resulted in the model being much lighter also.
As for other machinery, I didn't spend a lot of time at the belt sander or scroll saw so I minimised energy usage.
When binding all my house pieces together, I used a lot of UHU all purpose adhesive, which is a strong epoxy resin which is made from thermosetting polymers. So the plastic is manufactured from fossil fuels which will have a negative environmental effect also. This cant be prevented however as the glue is vital to construction.

Distribution:

Despite being held together with a very strong adhesive, it wouldn't be very practical to transport the model to my clients or a building company without taking special care or investing more money. The shape of the model allows it to be placed in a rectangular box easily, however there are some loose parts to the model which could break during transport. There are some fragile pieces on the model which could also break off. If done this way the model will not be able to serve its purpose on the other end. The model will have to be transported privately in a very controlled and considerate way. Which may mean more emissions produced (which will harm the atmosphere) as a separate vehicle is needed compared to transporting the model with many other items.

Useful Lifetime:

The main purpose of this model is to send it to my clients as well as well as a suitable building company to construct the house and make it a reality. By making a model, my clients can decide if they are happy with the design or not, they can suggest to me and changes they wish. So that these changes can be corrected prior to construction rather than after construction. Since changing the design on the model will be far less time consuming and use up far less materials rather than making the change in reality mid way through construction. When I send the model to the building company, they have a design to work from which will reduce the errors and make sure they buy exactly the right amount of materials rather than wasting materials. The reduction of construction errors also means reduction in time the construction vehicles are in use for (less pollutants onto the atmosphere) and less materials wasted again.

End of Life:

Once the model has come to the end of its useful lifetime, it would have shown my clients the final version of their house prior to construction and it has given the building company a detailed and high quality model to refer to when constructing the house. Once it reaches this point, the model will be taken apart as much as possible and separated into parts. Into recyclable and non recyclable parts. This must be done since if not separated the recycling plant will not separate the model themselves and will be forced to put the model into landfill. This is not ideal for the environment as I wish to have the materials re used in the future.

Testing & Evaluation: Specification Check

Function: Mark out of 5: 4

- The size of this house allows my client's family to live in comfortably and have their own personal spaces, the idea of three floors a large base area allow all this to be contained within the property and my clients to live in luxury.
  - **Test:** I have measured all of the house walls using a ruler and getting the total floor area for each storey, by using a 1:50 scale to get the real life measurements, confirming that there is enough living space for my clients.
- The Thermoslate roof tiles on the model mean that there is a significant environmentally friendly component on the house, the tiles are located on the rear pitch as well as the flat side roof. The lack of a rainwater collection system however, doesn't allow my clients to reduce their water bills annually.
  - **Test:** I have visually checked the model and there is enough Thermoslate area to make a significant environmental impact. However there isn't a rainwater collection system on the model, which is a significant loss to the environmental impact of the house.
- The overall shape of the house has been significantly reduced in width since the first development, this means the property can easily fit within the given plot and allowing the build to happen. There is enough space to fit a gravel path round the outside of the house.
  - **Test:** I've visually checked the perimeter of the house and measured (with a ruler) the space between the edge of the plot and the edge of the house. I have measured the width against length of the house and can confirm the greater length
- The final model has a large pitched roof as the middle section of the house, meaning there is plenty of loft space for my clients, they are able to store all their valuables without cluttering the rest of the house.
  - **Test:** I have used a ruler and a 1:50 scale to calculate the height and width of the roof pitch and therefore prove that there is plenty of space for storage in the roof.

Form: Mark out of 5: 5

- According to my clients: the overall shape of the property is very unique compared to their previous home, my clients have taken a liking to the curved roofs and complex design of the entrance and balcony. The design includes no red brick or any other generic material finish that my clients are used to.
  - **Test:** I have visually checked the exterior walls of the house and I have confirmed that the model shows the use of limestone bricks, oak cladding and slate shingles, this being vastly different to a regular red brick property.
- The model clearly shows many large rectangular windows with unique designs on almost all faces of the property, which is letting lots of natural light into the house,
  - **Test:** I have looked through the windows of the model to find that there are no real dark patches or areas of no light in the house, which proves that my clients will be getting the light and airy atmosphere inside the home that they deserve.
- The house model contains many different colours and textures so my clients will be happy with how complex and unique the colour palette is on the design, which meets their wants perfectly. There is evidence of slate on the roof, limestone bricks on the walls as well as oak cladding on the walls.
  - **Test:** I have visually checked the whole design, I have located at least five different colours and textures: Slate Shingles (Etched black card), Smoother EDPM rubber membrane (Glass paper), Limestone Bricks (Etched and painted MDF), Oak cladding (Oak veneer), Cedar decking (Etched veneer), Stainless steel (Shiny card).
- The house model shows no outrageous designs or colours on the outer shell of the house, this will create no visual pollution in the surrounding area as all colours are neutral and natural.
  - **Test:** I have examined the house model, the most unnatural colour / texture is shiny card (stainless steel), even though this fits in with the design, it is a strange material to be on the side of a house and may not fit in perfectly well with the surrounding designs.
- When looking back to the original specification, the house model should include oak framed windows. However this design utilises oak frames windows instead since my clients have changed their minds since that point.
  - **Test:** I examined the window frames up close, they successfully model the look of fibreglass frames and exactly match the bifold doors.

User Requirements: Mark out of 5: 5

- There is enough space in the final house model for 5 bedrooms, 5 bathrooms and an integrated annex area, provided you scale up (1:50) each measurement. There is enough space downstairs for there to be a hallway bathroom as well. Which allows my clients to have their own bathrooms as well as guests.
  - **Test:** I have used real measurements for average bathroom and bedroom size, then compared this to the scaled up measurements of my house (using a ruler and calculator), showing that all necessary rooms are able to fit in the house.
- The model has three bifolding doors located around the house, there being one opening out to the front balcony and one each opening up to the rear balcony and rear decking each. Allowing easy access to the outside areas of the house for my clients in the summer.
  - **Test:** I have looked at the front and back of the house, I have used a ruler to measure the size of each bifold door, they are the correct size given they are in a 1:50 scale.
- This model includes a large double garage on the front right of the house, which is capable of fitting in two cars and various other bikes / tools.
  - **Test:** I have used a ruler and a 1:50 scale converter to measure the height and width of the garage space, I have also place two 1:50 scale cars in front of the garage to prove that two card are able to fit inside.

Performance Requirements / Safety: Mark out of 5: 3

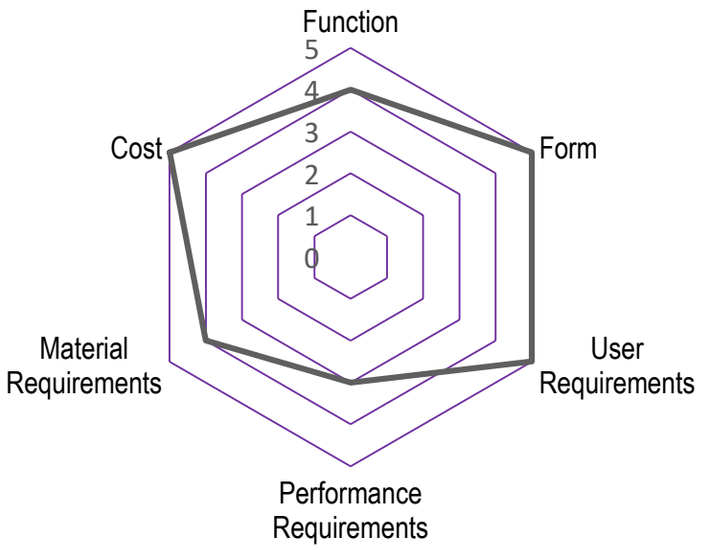
- This model doesn't indicate a huge amount of consideration to the elderly, however the front door isn't restricted by a large amount of stairs. The elderly relative doesn't have an extremely easy way to access as they will still have to tackle the single step up into the front door since there is no ramp available.
  - **Test:** I have confirmed this by visually checking the front porch area, the large step may prove difficult for someone who doesn't have full mobility.
- This model has taken into account the anthropometric measurements of the human body, meaning all areas of the house are accessible to everyone. The ceiling heights are all around 2.5m and all doorways are standard height. There is enough room for children to stand up in the 3rd floor also.
  - **Test:** I have tested this by measuring the ceiling height, the door height, as well as the 3rd floor ceiling height in all areas with a ruler and converting the 1:50 scale using a calculator. Confirming that every entrance and room is sufficient height for comfortable movement and practicality.

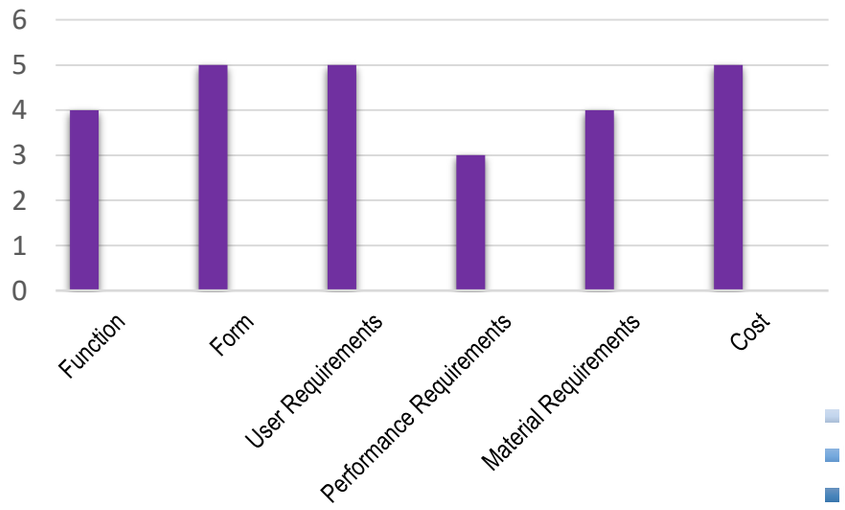
Material & Component Requirements / Sustainability: Mark out of 5: 4

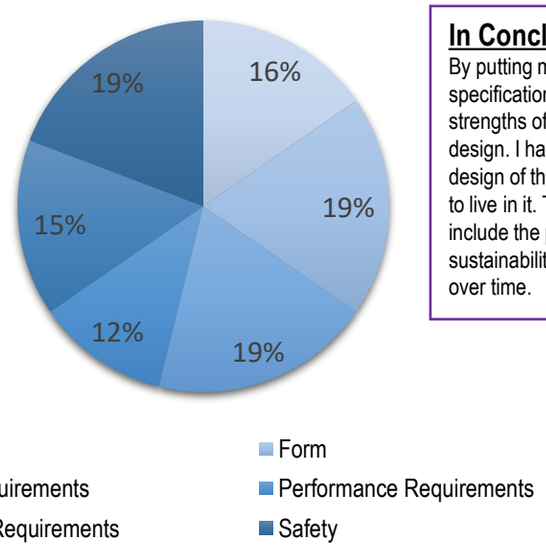
- The model indicates that the vast majority of materials that make up the house in reality will be environmentally sustainable, The large amounts of wood for the cladding and decking are sustainable materials, the slate shingles are sustainable as well as the bricks.
  - **Test:** I have tested this by looking at my model, referring back to the materials in reality and double checked that all materials can either be recyclable or have been sourced from existing products.
- All materials on the model have been durable, the model has been standing perfectly for a long amount of time. In reality, the house will contain even more durable materials which will be constructed and designed to last for many, many years.
  - **Test:** To test this I will be doing a small durability test on the model to ensure the modelling materials are durable, then this will reflect the durability of the model in reality, in terms of the overall shape of the structure.
- This model doesn't show a rainwater collection system anywhere, this is the largest downside to the model since the idea has been dropped during model making. My clients will not be able to reduce water bills by utilizing rainfall for washing / cleaning etc.
  - **Test:** I have visually checked the model and the component is not there.

Scale of Manufacture & Cost: Mark out of 5 5

- The cost of manufacture for the model was really close to my initial estimate of around £70, proving that I can work within a budget. Hopefully this transfers over into the real build.
  - I tested this by listing all the materials I bought, I didn't need to buy any more materials throughout the build so the project kept to its budget well.







In Conclusion:

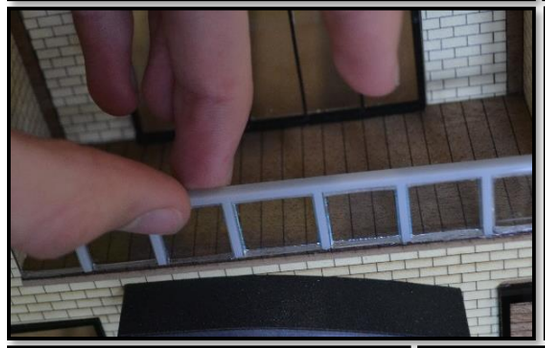
By putting my house model prototype against my specification, I have found that the main strengths of my house lie in the aesthetics of the design. I have truly satisfied my clients with the design of the property and they are very proud to live in it. The main weaknesses of the house include the performance requirements and sustainability. Mainly due to change of design over time.

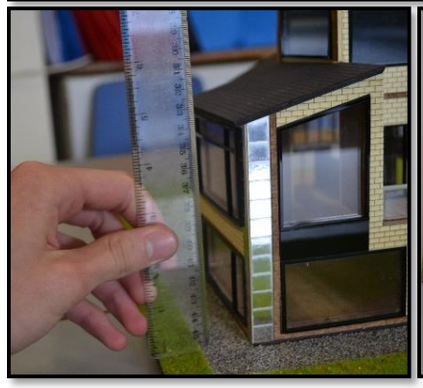
Score Justification:

I marked each point of the specification out of 5: 5 being that the spec is perfectly met in every way. 4 being that the model has met the spec very well still, but might be missing a single element. 3 Being satisfactory, the model may be missing some elements. 2 being pretty poor and the spec isn't met. 1 being very poor and the spec isn't met at all

Testing & Evaluation: Questionnaire & Model Testing








Client Questionnaire:

1. **Are you happy with the quality model / has it met your expectations?** We think that the model is extremely detailed and really accurately represents what our future house will look like. We are so impressed with the level of precision and accuracy of this model, it is very well put together. In fact, this model has gone way past our initial expectations from the start of the project, since the design has improved and developed so much since the first drawings we were shown. The model includes all the things we need in a house for our family, we're sure everyone will love the house once it is built.
2. **Do you like the overall design of the model?** Absolutely, the design is exactly what we had in mind and this model has done an excellent job of visually representing what we want from a large contemporary home. The design is a fine improvement from the initial designs and has greatly exceeded our expectations. We love the unique curvature of the roof design and complexity of the overall shape, we feel like we will stand out a lot living here as nobody will have a house that is the same. The design of the balconies allows us to spend a lot of time outside in the summer and host outdoor events with our family and friends, especially with the ease of access to these areas.
3. **Are you happy with the colour scheme of the model?** We adore the colour scheme of the house, the modelling materials you have used here really accurately portray the real life materials. We think that the black of the roofing and window frames go well with the limestone bricks. The cladding works really well with the brick colour also. We feel there are enough different colours and textures to keep the design interesting and make the house stand out. We are impressed with the accuracy of the model making and how you were able to replicate the textures of the real life materials so well.
4. **Are you pleased with the size of the model?** When we were able to see the model for ourselves in person, it is definitely large enough to see all of the fine details you have included. The size of the model is large enough to be able to include fine enough details to send to the construction company. If the model was any smaller we would not be happy with the level of detail included. We think the model is perfectly sized to examine and display.
5. **What is your favourite element of the design?** Aesthetically, we love the arrangement and designs of the windows around the house. This means that so much natural light can get into the house which will make a bright and airy atmosphere inside. We love the idea of the feature windows at the front and side of the house, with lots of nice separations which don't obstruct the view to the outside. As for materials, we are really impressed with the idea of thermoslate, we never thought we could disguise the look of a solar panel by integrating it into the slate tiles. This way we can be sustainable, reduce our energy bills each month and hide the ugliness of solar panels.
6. **Are there any improvements you could suggest for the model?** We can't think of any improvements we want to the model. We are completely happy with the design and it is exactly what we wanted. You have listened to all of our needs and wants through every step of the project. If there are any improvements we wanted then we would have already suggested them at an earlier stage in the project. We are more than happy to live in this house you have done an excellent job for us.

Third Party Feedback:

Joe: The model has an impeccable level of detail and accuracy. The fine details of the veneer with the silver card looks very professional. The scale is perfect as it will be light and easy to carry from place to place. Having the model people along side the model gives the viewer a encompassing sense of scale. The only change that I would make would be to add the floors into the model. This will help the client visualise the interior and the scale of the rooms inside the house. However this would then mean that the inside wall would need to be painted or covered to provide the finishing touches to the house.

Amy: My favourite element of the design in the balcony which sits above the front door, it improves the aesthetic of the front of the house and would also be a great space to spend an evening. A design feature that I would have changed would be making all the window uniform in style. At the moment on the front of the house the left hand side and top windows don't share the same bars as the rest of the house.

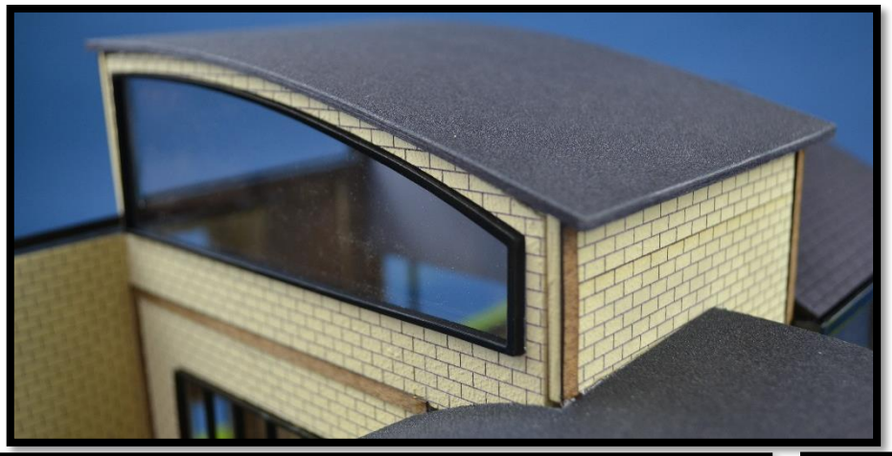
Social, Moral & Ethical Impacts:

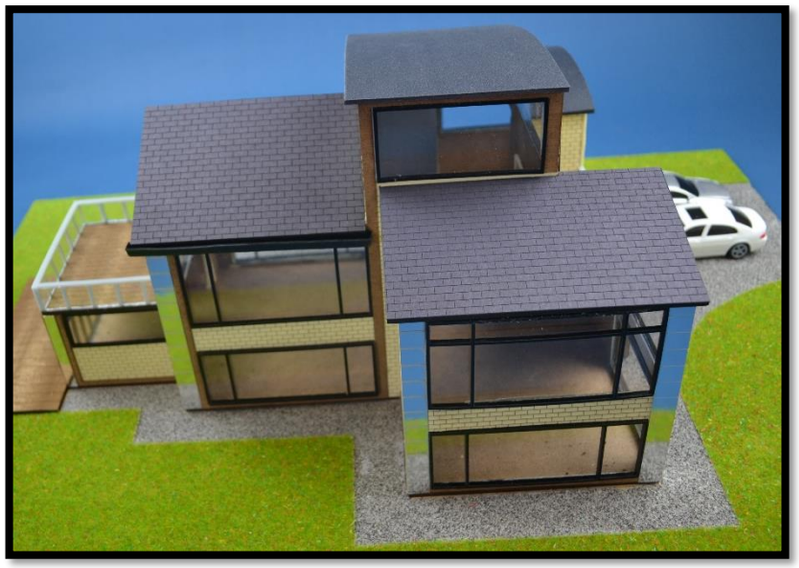
The design of the model is not outrageous or offensive in any way, the shapes used are widely acceptable and will not offend any passers by or anyone else within the village of Hale. The colours of the house are all very normal and will fit in well with the rest of the houses in the village. Limestone will not be new to the area and I am sure that many other houses in the area will be using similar materials. The most unique material is the stainless steel cladding which may catch the eye of some people walking past. The size of the house is very similar to others in that area so the house will not overshadow or put other designs in the background. The plot itself is quite secluded so any design choices will not be seen that much anyway. The shape of the design means that no parts of the house encroach on other plots of land near by so we should receive no complaints from neighbours at all.

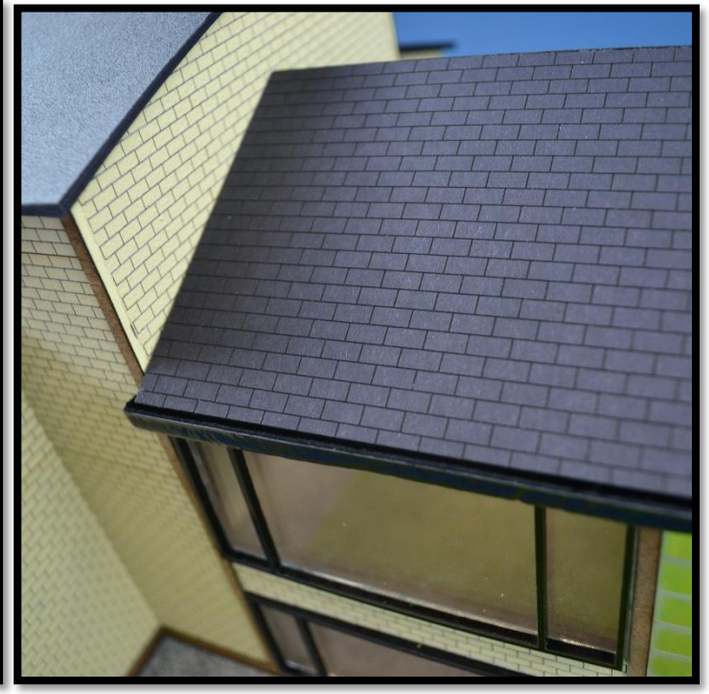
As it stands there is currently ne large health and safety issue with the house, and that is that the balcony railings are slightly too low, meaning that if anyone were to be running about on the balcony or leaning over the edge too much, there is a possibility that said person will fall. This was indicated my a model person having the balcony railing come up to just below its waist which is below the centre of gravity for a human. Action must be taken prior to construction and the balcony railings must be increased in height. In reality there are no materials included in the house where there is a serous danger for the workers extracting the raw materials. Cutting down trees for the cladding can be dangerous, however if it is done in a controlled way there is very little danger. The same can be said with mining for the slate or limestone, it can be dangerous but professional companies I will be sourcing the slate from will be mining in a controlled fashion.

This model has had very few negative ethical impacts because the majority of materials I have used have utilised environmentally sustainable materials. For example the MDF for the house walls is man made but is made from natural wood which can be replanted after being cut, the same goes for the cladding and baseboard. The acrylic for the window frames and panes is the only negative impact since it is a man made product which is created from finite fossil fuels which will harm our planet over time. All materials can be recycled after the model has served its useful life so it has a very low environmental impact overall.

Final Pictures:







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