

ARCHITECTS STATEMENT

Cantilever House

Land off Blacker Green Lane

Silkstone

Barnsley S75 4NF

May 2016

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2.0 Design Brief

The challenge from our clients was to design a cutting edge dwelling which would utilise Silkstone beck and Blacker Dam to provide hydro power as a renewable energy source.

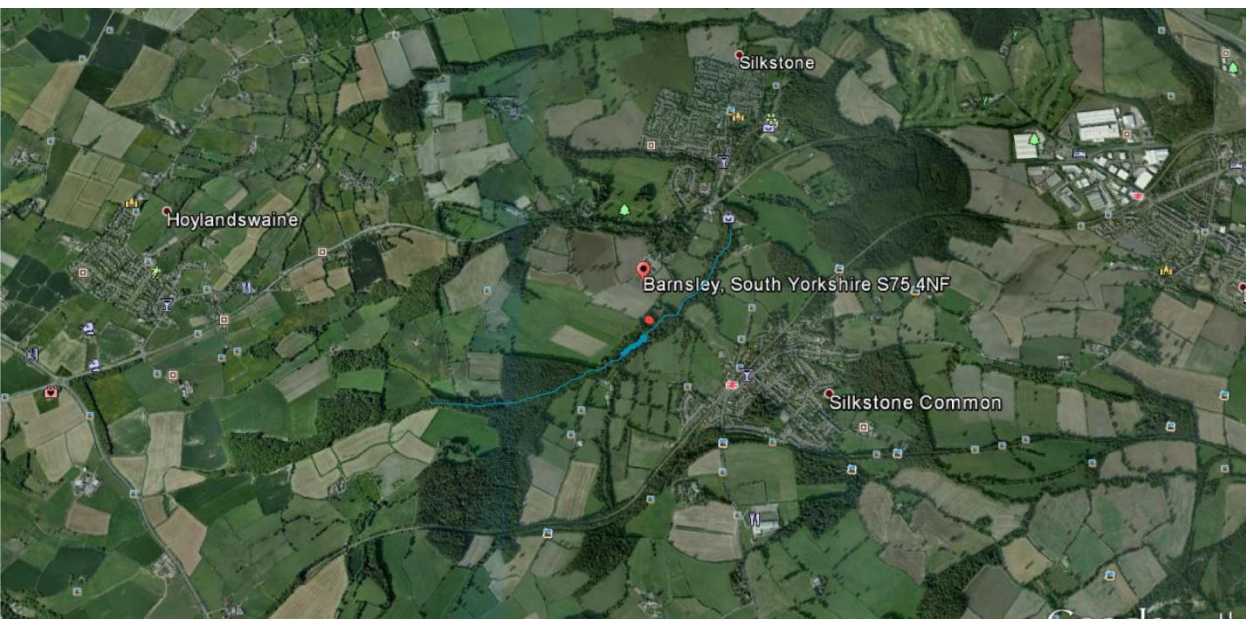
The earliest record plan we could find of 1829 shows the outfall of Blacker dam to be S.E point of the dam, it as since changed to the N.W. corner and flows out through Silkstone Beck, eventually joining Cawthorne dyke and then the river Dearne.

This connection to the water and the industry the watercourse served shaped our early design thoughts and conceptual design sketches which were presented to design review in April 2015

The site upon which the dwelling will sit was originally used as playing fields up to 1978 and thereafter as a car park used by Leeds fishing club, the ground is a flat area of made up ground.

The site is challenging for a number of reasons

- The site is greenbelt
- The site is steeply sloping down to the beck
- There are a number of trees
- Hydro power is a client requirement to link the use historically to the site
- Avoid external domestic paraphernalia
- The design should compliment the rural setting as a positive form.





3.0 Site Analysis

The site has a level plateau with a vehicular access from Blacker Green Lane and is made ground

This plateau falls steeply down to Silkstone beck which in turn is in a cutting and flows from Blacker Dam.

The hillsides contain self seeded woodland and this is continued down blacker green lane, best described in the landscape report

The only real public view of the site is from Blacker Green Lane and even this very restricted due to trees and hedgerows along the road. our aim is to view the building as a sculptural object within the landscape, the juxtaposition adding to rather than taking away from the surroundings. We consider this as art in the environment, a good example of this is Yorkshire sculpture park. The pieces of art are seen to add to the natural landscape and we drew on this as part of the design philosophy.

To emphasise this we were careful that the elevations seen from the road side were simple forms without windows or doors, the materials and form being the expressive elements.

There is a natural clearing in the trees affording a view from the site to Blacker Dam and our building is orientated to this view. This is also a south west view which we can explore for natural light.

Sun path diagrams were prepared and illustrated through design review to show how the design directly relates to the natural environment.

The driving force behind the site is the water both the dam and the watercourse flowing within the cutting, our design seeks to utilise this not only for power but as design driver. Historically there were 9 mills on the Silkstone beck used for various industry and these provide the inspiration for form and material as will be discussed further in this report.



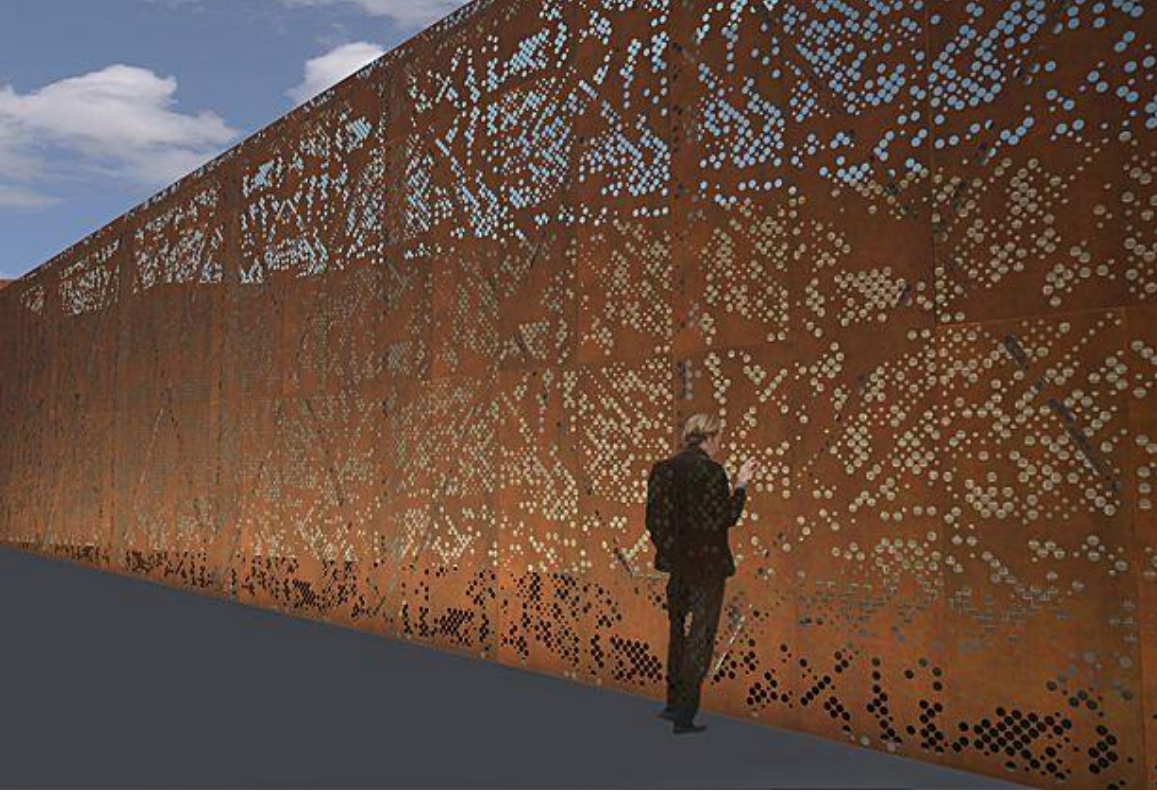
Examples of sculpture in the natural environment

There are many examples of art in the built environment and there will always be questions around appropriateness.

We aim to show through other examples that a sculptural form in a natural setting can add to the delight of the setting by further stirring emotion and posing questions.

The tension between material and form can be a thing of great beauty and we should not automatically dismiss using art in natural settings due to a preconceived idea of inappropriateness.



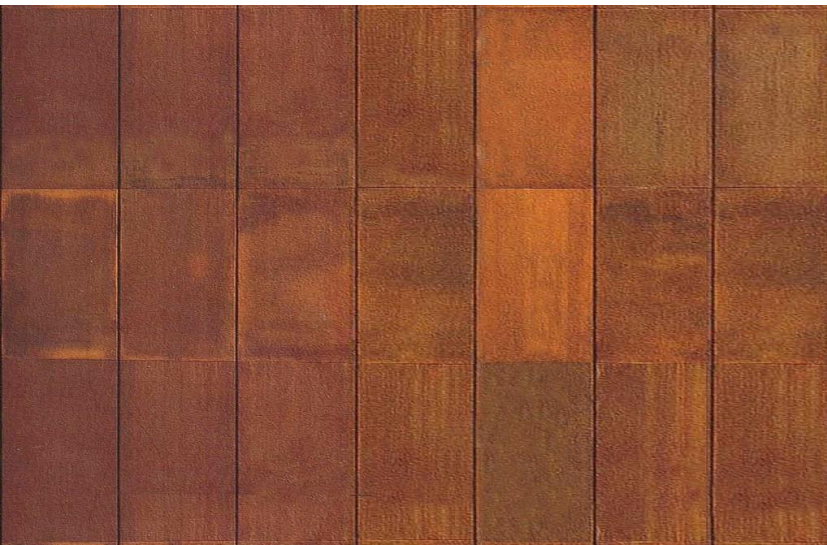


There is a quality of light to the site which is ever changing as the seasons change due to light filtered through trees in various stages of leaf, we have drawn on this in our choice of material for some of the screen elements, preferring a perforated rather than solid skin.

Trees use the cantilever as the very basis of their function and survival and we have used this in our design to allow our structure to simply cantilever out over the beck and float among the trees.

There is an existing vehicular access to site which we intend to reuse but will quickly take vehicles below ground and out of site allowing the remainder of the site to remain a natural wild flower meadow.

Any gates to this entrance will be of an agricultural nature to maintain the rural feel of the site





cascade



Site pictures



Steel bridge material inspiration



looking back to site from Blacker Dam



Steel bridge

Blacker Dam

Site pictures



Entrance to site from blacker green lane



From centre of site looking back to entrance



Panorama from north east to south west



Typical mill buildings down stream of Blacker Dam



4.0 Inspiration

Our initial thoughts were influenced by the history of the site and the connection to water not only for its natural beauty but also its delivery of power for industry.

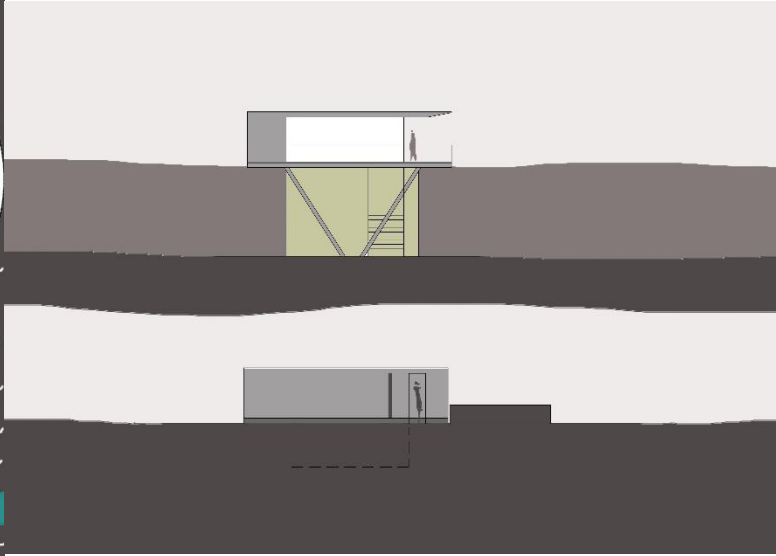
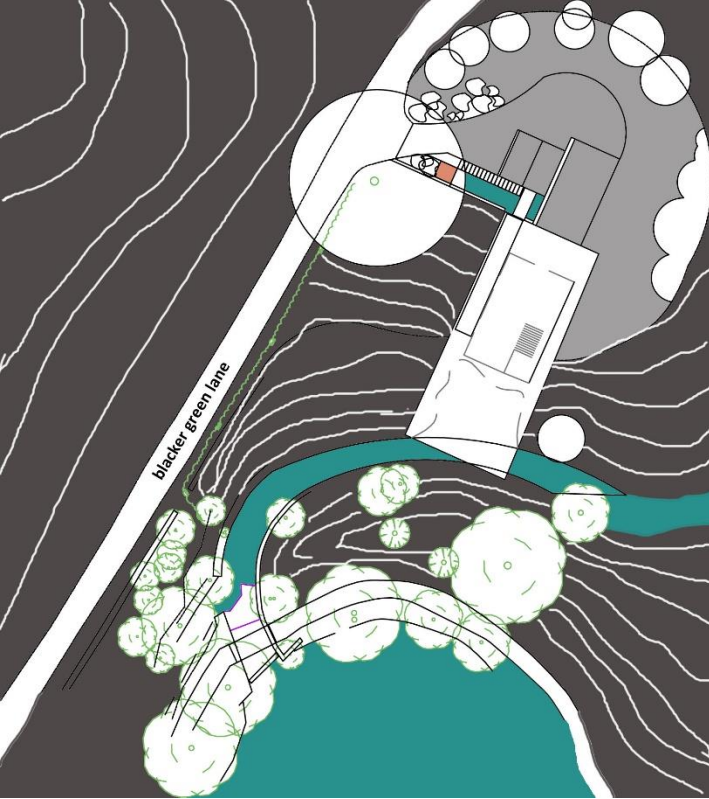
Water is a very therapeutic and calming natural element which we made intrinsic to our design development, it has inspired us to be bold in our design. Perhaps the most famous design being that of Frank Lloyd Wright and his design called Falling Water, this is clearly inspirational for any architect.

Some of the mills historically touched the water, almost dipping a toe into the current, we have opted to do the same, the feeling that part of the building can over sail the stream while its base is gently washed by the flow of the water is a powerful design driver and one which we were keen to follow.

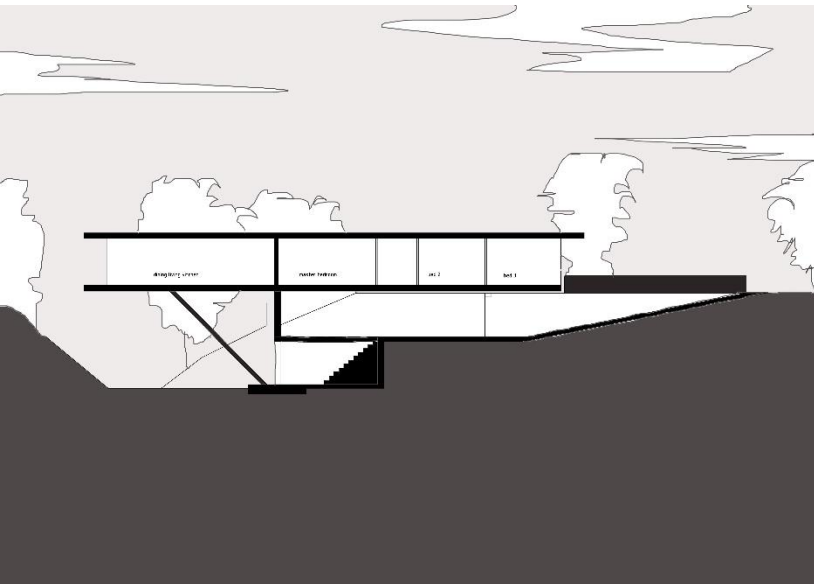
In respect to the natural quality of the site an early decision was taken to consider part of the building below ground, the remaining part should be elegant, simple uncluttered and of hue akin to the natural woodland.

The trees also gave us clues for design ideas, the cantilever structure, dappled light, changing sense of volume between seasons (in leaf and out of leaf)





Design development drawings



5.0 Design.

Our early design ideas explored natural forms related to water, trees, boulders, movement and light.

Design development can be seen in the attached design review submission documents.

These were explored in great detail and resulted in a number of design ideas which were taken to design review.

The panel were very supportive in the direction of the design and were keen to see the design develop and be reassessed at a second review.

The early designs looked at 3 options

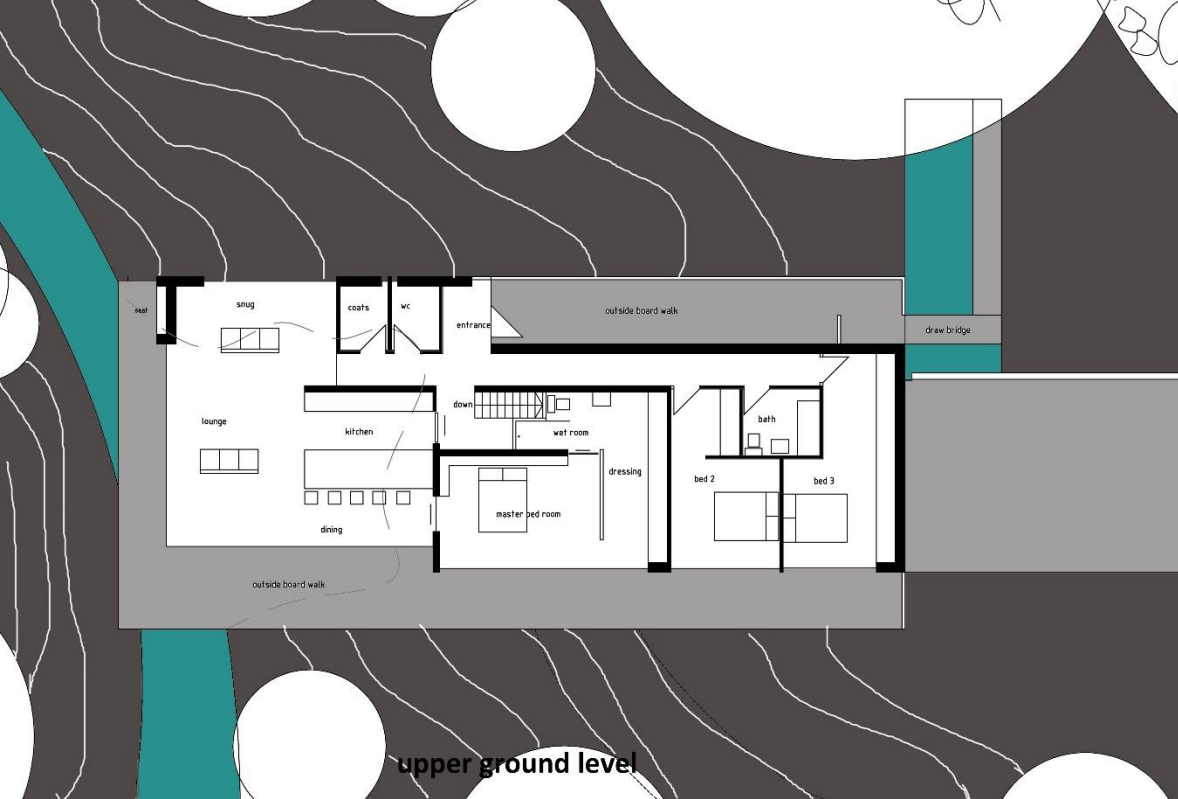
- Cantilever
- Tumbling rocks
- Tree house

It was decided to progress the cantilever option as this had a closer fit to the site and could explore the connection to the water better. It is a sculptural form and will be seen as such within the landscape

This was taken to a second review in November 2015 and was again received well. We were asked to show how the building responded to the landscape and make the connection with the water absolute.

The design has since been developed to reflect those comments, a full landscape report is attached, materials for construction have been selected, the building now sits in the water and the hydro power connection has been researched.

The main living accommodation is contained at ground level, indeed the structure will appear to float just above ground this gives a weightless feel to the building as it further extends as a cantilever over the beck.



The living spaces look out toward the woodland and the dam, the public elevations are deliberately blank of normal domestic features. The pedestrian entrance being through a simple slot in the façade served by a drawbridge platform which is lowered to allow access over a still pool. This is the first reference to water.

The entrance corridor is actually an external space which is shielded from public view by a perforated steel skin, which is a reference to the dappled light from the trees. The front of the building is a simple steel rain screen. All steel is left as a natural rust colour which blends with the tones of the natural landscape.

Steel is chosen for its historical reference being a material used and worked in the mills along this beck over the last 200 or so years.

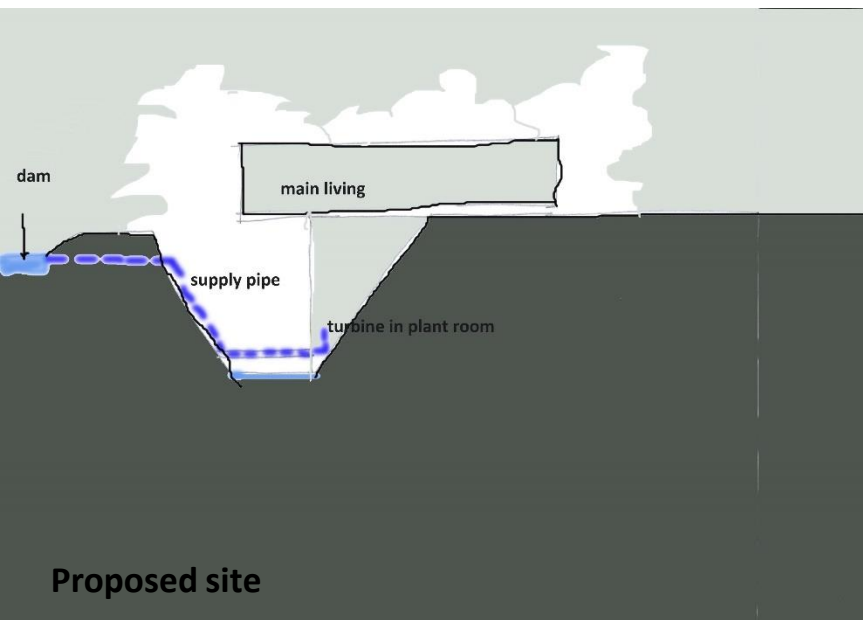
The private elevations not seen from public view are a series of sliding glazed walls which open onto an external boardwalk protected from the weather by an overhanging roof, which also provides solar shading. This private external space negates the need for typical external garden space thus allowing the land around the building to be left as natural landscape. It is the intention to plant as much of this as possible with wild flower meadow to improve bio diversity.

Below the ground floor is an undercroft area for parking and a secondary access into the dwelling. This space also contains the main utility area with clothes drying facilities keeping all signs of domesticity out of view. From this space there is access down to the stream where the plant room is contained. This is the space where the hydro electric input is taken from the water course.





Modern approach



Traditional wheel



6.0 Hydro Power

As stated before one of the unique features of this proposal is to harness the power of the water as a renewable energy source to supplement the energy demands of this dwelling. We have discussed the design possibilities with Derwent Hydro electric Power Ltd of Hazelwood in Derbyshire.

They are proponents of micro hydro power installations and have indicated that it should be possible to generate a minimum of 2kw from a simple turbine system.

Historically mill wheels were used to provide power often set aside from the main water course and powered through a tributary called a head race.

Modern methods differ in that water is forced through a pipe which not laid in the water course, it relies on a head of water to form pressure to turn the turbine within the plant room.

We intend using this method by taking water from the dam via a pipe to our plant room turbine. The exact siting and pipe sizing to be agreed when Derwent Hydro electric are appointed.

A simple route would be from the dam down the hillside and across the beck and into plant room as shown in the simple diagram opposite.

There is a beauty about this simplicity which connects this building to its site.

Materials 7.0

The materials we consider most appropriate have been selected to reflect the history of the site and to compliment the current natural surroundings

- Steel rain screen cladding – this is a direct historical reference to the smithies which were sited on the beck and used the water for power. It will be left in a rust colour and sealed. The hue will be that of an autumn day
- Perforated steel with apparent random perforations to reflect the dappled light created by tree canopies
- Timber for the boardwalk around the building, a natural reference to the natural landscape around
- Concrete for the undercroft and main support. Traditionally stone would be used for the mill house and weirs, a modern interpretation of dam formation is the mass of concrete. This will be left in a natural state.
- Zinc for the roof is a traditional material easily formed to give a crisp edge





8.0 Sustainability

As well as looking at how the building impacts on the environment we have considered how the building will impact and respond to our clients needs, developing the scheme where required to make the spaces as usable and adaptable for future needs as possible.

This idea encompasses everything from providing drying space for clothes, a quiet space for a home office to location of bins for easy access and use.

Through considering the categories of the code assessment for sustainable homes we understand that if the building is correctly designed and constructed then the occupants can live in the property appropriately, efficiently, sustainably and healthily.

This dwelling is designed to meet minimum code 6. yet may also achieve passiv haus standard

8.01 Code Assessment

The code for sustainable homes reviews dwellings on a number of categories: the points attained on each of these categories combines to form the code level.

Mandatory issues

- a) Environmental impact of materials (Mat 1)
- b) Surface water run off (Sur 1)
- c) Storage of non-recyclable and recyclable household waste (Was 1)
- d) Construction site waste management (Was 2)

Once the mandatory standards have been satisfied designers and developers can choose tradable credits. The primary categories being :

- 1) Energy & CO2 emissions
- 2) Water usage
- 3) Materials
- 4) Surface water run off
- 5) Waste
- 6) Pollution
- 7) Health and well being
- 8) Management
- 9) Ecology

We will be appointing a qualified code assessor as detail design progresses, however a synopsis of our approach is as follows:

Materials – Not all materials have been specified but the primary structure will be ICF concrete this will be used for walls floor and roof. This system is rated A+ in the green guide. Key factors in the use of ICF concrete are

- 110 tonnes of CO2 saved compared to a traditional timber frame house over the building lifetime
- Reduced operating energy use due to stable environment created by thermal mass
- Long service life typically over 100 years
- Use of local recyclable materials

Surface water run off – Credits are awarded for schemes for developments which avoid, reduce and delay the discharge of rainfall to public sewers and watercourses – thus reducing the risk of flooding and other environmental damage.

It is our intention that surface water will be discharged back into the beck giving back to the source of power utilised .

Storage of Non-recyclable and recyclable household waste, linked to the waste category. Credits are awarded for the provision of internal and external storage space for both recyclable and non-recyclable household waste. Storage must be adequate and accessible. Credits can also be awarded where there is provision of a local authority recycling scheme.

Barnsley currently subscribe to the national standard of 4 external bins and we will provide space for these . These will be used for general and food waste, glass, plastic and paper products.

This will ensure maximum credits for this category.

Construction site waste management, linked to the waste category.

Credits are awarded for managing and reducing construction waste through use of a site waste management plan. Site waste management plans monitor and record construction site waste groups in order to reduce and recycle construction waste and divert waste from landfill.

Our detailed appraisal of this will be submitted when final construction materials are known in the post construction stage.

Review of primary categories

1 Energy and CO2 emissions

The proposed building will be designed to minimum code 6

- Dwelling emissions
- Building fabric u value i.e. Heat loss
- Air tightness
- Internal lighting
- White goods efficiency. All A+ rated under the energy efficient labelling scheme

1.1 Drying space – A clothes drying space of 6m+ will be provided

1.2 Low or zero carbon technologies – further information to follow in respect of ground source heat pump and pv systems once a full passivhaus assessment is complete

1.3 Home office – Specific location for home office

2 Water usage

2.1 Indoor water use- water consumption will be limited to 80ltr per day

2.2 External watering of plants will not be required as the landscape will be set to a natural state.

3 Materials

3.1 Environmental impact of materials – this is a mandatory field as discussed above

3.2 Responsible sourcing of materials – further information to be provided, all materials will be responsibly sourced to achieve maximum credits

3.3 Responsible sourcing of finishing materials- we will seek to use local materials where possible and avoid gypsum plaster where possible due to high embodied energy

4 Surface water run off – this is a mandatory field as discussed.

5 Waste -this is a mandatory field as discussed.

6 Pollution- further information to follow post construction pending detailed specification of insulants.

7 Health and wellbeing

This is an essential element which affects the daily life of the occupants. The design has been developed with our clients to provide the internal spaces required which can easily be adapted for future use. The environment will receive natural light from various angles to enhance the quality of the indoor space

There is a direct connection to the outside space both visually and physically.

7.1 Daylight – Maximum credits will be achieved, all major habitable rooms have acceptable daylight ratio.

7.2 Sound Insulation – This will achieve a standard equivalent to part E of the building regulations

7.3 Private Space – The internal spaces can be sub divided to provide quiet areas

7.4 Lifetime homes.- Difficult to meet all criteria due to the level change f. However once inside consideration has been given for future situations, lift space available, level thresholds, wide circulation and generous sanitary areas

8 Management

8.1 Home user guide – to be addressed post construction stage

8.2 Considerate constructor scheme- a minimum of Best practice will be adhered to

8.3 Construction site impacts – further information to be provided post construction

8.4 Security – We will instigate the principles and philosophy of secure by design



8.02 Passivhaus

In addition this house will be designed to passivhaus standards.

So what is passivhaus and how does it compare with the standards set in the uk by building regulations and code assessment for sustainable homes.

What is a Passivhaus

A building designed for ultra-low energy consumption combined with very good internal air quality. This is achieved with super-insulation, thermal bridge free design, heat recovery ventilation and highly controlled air infiltration rates. From early in the design process, special energy modelling software - the Passivhaus Planning Package - is used to calculate how the proposed design will perform.

A Passivhaus uses around 90% less energy for heating than a typical building; 75% less than typical new builds. The table below from the Passivhaus Institut illustrates how a Passivhaus compares with other typical average and low energy standards.

A Passivhaus is not only about ultra-low energy consumption. It is also a build quality, indoor air quality and thermal comfort standard. The Passivhaus standard concentrates on minimising energy in use; it does not address other issues, such as the embodied energy of materials used, or their lifecycle environmental impact, water use etc. However, there is no reason why other codes and standards which address these other issues cannot be applied alongside Passivhaus.

The Passivhaus standard is strongly driven by what has been proven to work by experiment and practice – there is significant and growing body of scientific research which underpins the standard.

Passivhaus is about minimising dependence on overly complex and potentially unreliable technology. Its focus is on the design of the building, rather than the add-ons to it.

Technical requirements

The table below shows the key technical characteristics of a Passivhaus. The first four must be met in order to achieve the Passivhaus standard. The last two are key criteria in ensuring good internal air quality and high levels of thermal comfort.

Requirement	Criterion
1. Airtightness	0.6 air changes per hour at 50Pa (positive and negative) pressure
2. Annual Heat (Cooling) Demand*	15kWh/m ² .a (kWh per square metre per year needed to provide space heating to 20C, or cooling in hot climates)
3. Maximum Heat (Cooling) Load*	10W/m ² (maximum power needed to maintain 20C internally when it is -10C outside)
4. Primary Energy Consumption	120kWh/m ² .a (kWh per square metre per year needed to meet <i>all</i> energy demands, energy defined as consumed at source, e.g. heat extracted from fuel at power station)
5. Ventilation	30m ³ per person per hour (needed to provide fresh, healthy air to building occupants)
6. Minimum Internal Surface Temperature	>17C (lower surface temperatures cause convection driven drafts; this target avoids this allowing all parts of the building, even those adjacent to windows to be used)

How does Passivhaus compare with other building regulations and standards?

In the UK, the mainstream building sector has to meet minimum energy standards defined in Part L of the Building Regulations. Those building for the social housing sector must also meet tougher standards in the Code for Sustainable Homes (CSH), which covers energy, water use and other criteria. It is hard to compare CSH and Passivhaus directly, as CSH defines energy performance in terms of carbon emissions, rather than energy. This has led an effort to build "zero carbon" homes, however, such buildings still use considerable amounts of energy due to the relatively poorly performing building fabric: three or four times that of a Passivhaus. These "zero carbon" homes are often covered in photovoltaic panels and heated with bulky and expensive bio-mass fuelled boilers to reach the zero carbon target. By focusing on reducing the building's energy demand by "getting the fabric right", it is then cheaper to add a modest amount of renewables to make a building "zero carbon", should a client wish to and should site conditions permit.

The table below from BRE² summarises the key differences between Passivhaus and typical UK new builds:

	Passivhaus Standard	UK new-build common practice
Compact form and good insulation:	All components of the exterior shell of a Passivhaus are insulated to achieve a U-Value that does not exceed 0.15 W/m ² /K	Limiting U-values of approximately 0.25-0.35 W/m ² /K
Southern orientation and shade considerations:	Passive use of solar energy is a significant factor in Passivhaus design.	Some consideration is given with regard to north/south orientation, but the improved energy savings resulting from passive site design are often overlooked. 1.8-2.2 W/m ² K typical
Energy-efficient window glazing and frames:	Windows should have U-values not exceeding 0.80 W/m ² .K for both glazing and frames - this requires the window frame to incorporate insulation and the glazing to be triple. Solar Heat Gain Co-efficient or "g-value" through the glazing should be at least 50% ³ .	
Building envelope air-tightness:	Air leakage (n ₅₀) through unwanted gaps and cracks in the building fabric must be less than 0.6 times the house volume per hour under negative and positive pressurisation.	Design air permeability of 7 to 10 m ² /hr/m ³ @ 50 Pa. This is approximately a factor of 10 poorer than the Passivhaus standard.
		Research has also shown that air permeability values for completed dwellings frequently exceed these design limits.
Passive preheating of fresh air:	Fresh air may be brought into the house through underground ducts that exchange heat with the soil. This preheats fresh air to a temperature above 5°C, even on cold winter days.	The majority of new-builds do not achieve good enough air permeability values to warrant the incorporation of a whole house ventilation system - thus trickle vents, extract fans, or passive stack ventilation is commonly used.
Highly efficient heat recovery from exhaust air using an air-to-air heat exchanger:	Most of the perceptible heat in the exhaust air is transferred to the incoming fresh air (heat recovery rate over 80%).	
Energy-saving household appliances:	Low energy refrigerators, stoves, freezers, lamps, washers, dryers, etc. are indispensable in a Passivhaus.	Dedicated low-energy lights are provided in a number of rooms in a new dwelling - if appliances are supplied they will be generally C-rated or perhaps 'Energy Saving Recommended' in some instances (as these are widely available).
Space heating/cooling energy demand	Less than 15 kWh/m ² /yr	55 kWh/m ² /yr or greater

Cawthorne dike and silkstone beck historic mills

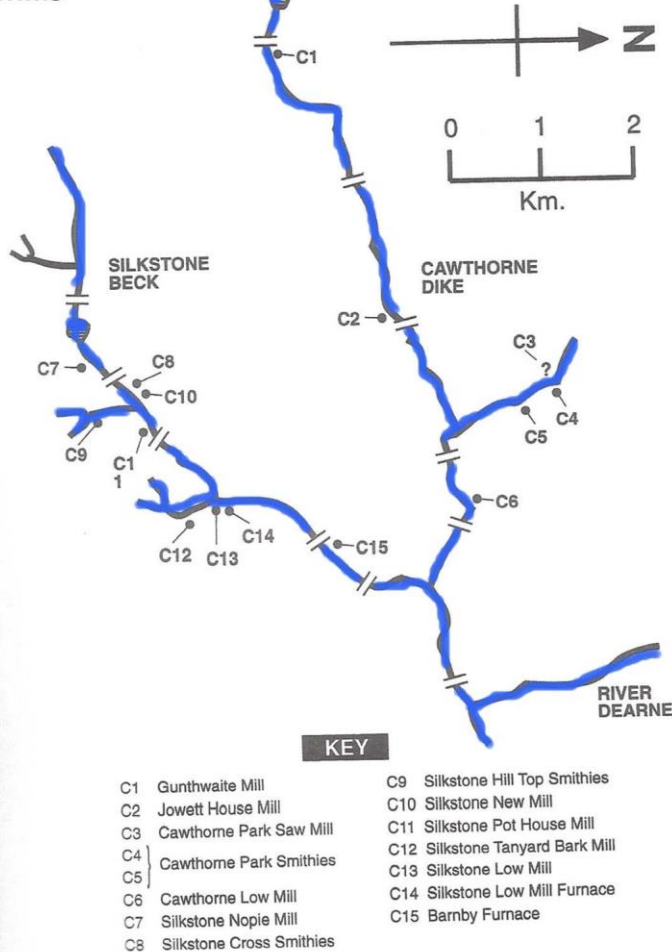


Figure 10 Site Locations - Cawthorne Dike & Silkstone Beck

Site 1946 showing boat house



Conclusion

Historically the silkstone beck as been used to power the various mills along its length since at least the 18th century and maybe before.

As noted previously this connection with water has been a major design influence, it is this connection which roots our building to the site.

There as always been a direct public use of the land around blacker dam, be it for recreational fishing or boating, various buildings over the years have been used as tea rooms, ticket offices and boat houses, so built form in this locality is not unusual.

Through the design review process we have shown how the building responds to the site in form and material, we consider it a sculptural form which will add to the quality of the landscape in which it will sit rather than detract from it. To further enhance this we have made sure there will be no signs of normal domesticity on view, all vehicles will be below ground in an undercroft area as will clothes drying and utility spaces.

Building a house to code 6 and also passivhaus is to build to the very highest standards of design in Europe in terms of sustainability, health and wellbeing.

If we can build to these standards in a creative way with respect for the immediate site and surroundings then this can only be a positive addition to our built environment.

In addition to meeting the very highest standards technically we are striving to create a building of true architectural quality.

To achieve this the building must respond to the site, be inspiring, be thought provoking, be sustainable, it should be respectful but clear in form and function.

Not only do we think the building meets this criteria, it is truly linked to the site, being plugged into the water. The water is not only used as energy the very nature of it gives a feeling of calm and well being which is reflected in the design